

Annual Report

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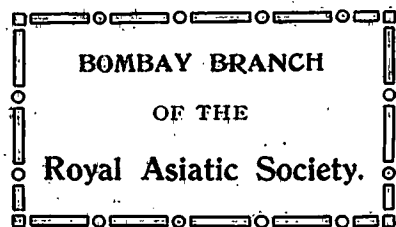
Department of Agriculture in the Bombay Presidency

For the Year 1928-29

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1928-29

CHAPTER I

GENERAL

AGRICULTURAL CONDITIONS OF THE YEAR

The year under report was on the whole a good one, both in the Presidency proper and in Sind where the inundation of the River was quite satisfactory. The outstanding climatic feature of the year was the frost wave which swept over Sind and the northern half of the Presidency proper at the end of January and beginning of February. This was so intense that in time to come the year 1928-29 will probably be referred to as the great frost year. The temperature at Sakrand (Sind) fell to 20°F on the 1st February 1929, or ten degrees lower than what is usual. Temperatures almost as low prevailed for several days, and rabi crops such as early sown wheat suffered severely. Fruit trees were heavily damaged while jungle trees such as Babul, Salvadora Persica and Caparis Aphylla sustained great damage.

In Gujarat the severe cold lasted from the 30th January to the 2nd February 1929, and at first it appeared that a large part of the cotton crop had been wiped out but this view proved to be exaggerated as may be gauged from the number of full-pressed bales recorded in this and the preceding seasons :—

Year.	Number of full-pressed bales.
1927-28	282,671 (of 400 lbs. each).
1928-29	226,705 do.

In the Deccan the most alarming consequences of the frost were in connection with the sugarcane crop on the Godavari and Pravara Canals. There was no precedent of an equal magnitude for such a situation. In this zone the appearance of the cane crop was suggestive of a calamity and growers

estimated the damage at 80 per cent. The leaves and tops of the cane were withered to a grey colour, while the top-most two or three internodes were found to be dead and rotting. This stopped the natural growth of the cane, and the sap was diverted into the buds immediately below the destroyed tops and these began to sprout. At the time of the frost the cane crop fell into one or other of four categories :—

Category.	Description.	Estimated damage.
Plant	Grown from sets planted within 12 months of the frost.	} 25 to 40 per cent. according to the age of the crop.
Ratoon	Second crop from the roots of a previous crop.	
Nidwa	Third crop from the roots of a ratoon crop.	
Adsali	Planted in the monsoon and intended to stand 18 months.	

In each of these categories the age of the standing crop varied from six to eleven months. The young crop in each case suffered most damage, and the main losses were due to the fact that this cane had to be harvested prematurely. The other chief source of loss was the difficulty experienced in making good gul from immature cane. It is satisfactory to note that the Department of Agriculture was able to render useful services to cane-growers by advising them what to do in the circumstances through the deputation of a Chemist for two months who worked out and demonstrated the proper procedure to adopt in making gul from immature cane. This officer has made the following interesting observations on the nature of the effect of the frost upon the cane :—

“There was high increase in Glucose (reducing sugars) which is due partly to the cane being premature for harvesting, the growth being stopped, by burning of the growing point and subsequent rotting of the shoot and to the inversion of Sucrose by sprouting of dormant buds. This had a bad effect on the quality of juice. There was a decided decrease in the percentage of Sucrose due to the above causes and thus the purity of the juice had gone down enormously. This had lowering effect on the quantity and quality of Gul even in the case of cane which was considered as unaffected. There was no appreciable change in the Brix from day to day as an after effect of frost though there was a lowering of yield in Gul, in almost all the canes. It is due to the decrease of Sucrose contents and probably to the presence of higher amount of albuminoids and other solids.”

Apart from direct damage cane-growers suffered the following further incidental losses :—

- (1) loss of "sets" for the next season's planting,
- (2) loss of cane-tops as fodder for the cattle of the contractors who crush the cane,
- (3) increase rates, due to heavy urgent labour demand, for harvesting the crop.

Other crops in a tender stage also suffered, and in particular the Nasik grape crop was destroyed.

The most important matter pertaining to prices was the price of gul. In Poona the price fell steadily from Rs. 33 per palla of 240 lbs. in October 1928 to Rs. 23 in February 1929. Thereafter it rose steadily month by month to Rs. 32 in June 1929.

OUTSTANDING EVENTS OF THE YEAR

The year under report has been eventful in several respects. The second Presidency Agricultural Show was held at Ahmedabad in November 1928. There were some misgivings whether it would be possible to organize this Show at a Mofussil Station some hundreds of miles from the headquarters of the Department of Agriculture. These were duly set at rest by the great success of this Show. In all important respects this Show was quite the equal of the first Presidency Show held in Poona in October 1926, while some sections taking advantage of Poona experience, were an advance upon their counterparts at the first Show. For example the Research pavilion was distinctly more impressive indicating the fact that the staff have made progress in devising ways and means of visualizing, to the public, the meaning of research in agriculture. The same was true of the Pestology pavilion which however was unfortunately burnt down a few minutes before the Show was opened. The Rural Education section afforded another example of marked advance on its predecessor. The more spectacular sections, such as the Engineering and Livestock Sections, both, more than maintained their Poona reputations, while the Horticultural Section which had to be organized under much less favourable conditions than at Poona, proved one of the great attractions of the Show. The attendance at this Show, was also very satisfactory. The principal organizers of the Show, namely :—

Mr. W. W. Smart, Commissioner of the Northern Division
(Chairman),

Rao Bahadur Bhimbai M. Desai

and

Mr. B. S. Patel

} Joint General Secretaries,

deserve special commendation for their sustained and

well-directed efforts, which culminated so successfully. It was a fortunate fact that in organising this Show, the Commissioner was able to draw upon his personal intimate knowledge of Agriculture generally and the Department of Agriculture in particular, acquired during his period of office as Director of Agriculture.

Another incident of far reaching significance which distinguished the year under report was the establishment of the Imperial Council of Agricultural Research which was formally inaugurated in June 1929 by His Excellency the Viceroy. Thus has been implemented what is probably the most valuable of all the hundreds of recommendations made by the Royal Commission on Indian Agriculture. Action is now in progress to set up a Bombay Provincial Research Committee to work in collaboration with the Imperial Council.

SIGNS OF AGRICULTURAL PROGRESS

In a settled country changes in agricultural practice usually take place slowly, particularly when they involve a definite advance upon the past. Two examples of the latter type of development may be mentioned here. First of all there is the Cotton Markets Act which is a real attempt to place the marketing of this important crop on a more satisfactory footing in the primary markets up-country. Steps are now being taken to organize the first of these regulated Cotton Markets at Dhulia, and it is also hoped to establish at least one regulated market in the Northern and Southern Divisions of the Presidency in the ensuing cotton-selling season. The object of such markets is to place control in the hands of a responsible committee consisting of growers and traders, and the particular object is to eliminate the well known abuses which at present prevail in the existing unregulated markets and thus ensure for the grower the full value of his produce, without any unauthorized deductions and to do away with unfair weighments and other abuses.

If these regulated cotton markets prove successful it is the intention to make this reform the precursor of improved marketing for all agricultural produce.

The second example of agricultural progress to which attention may be directed is the tendency towards the adoption of fertilizers for staple crops. Sulphate of Ammonia has now been an integral part of sugarcane manuring in the canal tracts for some years, but it is only quite recently that the rice-growers of this Presidency have begun to appreciate it.

Both in Northern Gujarat and in the North Konkan there are now being consumed appreciable quantities of this fertilizer. Thus in the latter tract 77 tons are reported to have been sold. There is also evidence of the same development in Sind.

THE TRADE AND AGRICULTURE

This advance in agricultural practice is closely bound up with a change in the attitude of the trade towards agriculture. By the trade is meant those firms which trade with agriculturists either as sellers or buyers. A few years ago it was characteristic of leading Bombay business firms to act as mere sellers of agricultural requisites, taking little or no interest in the satisfaction given to their customers. A plough would be sold regardless of whether it fulfilled the purpose of the buyer. This indifference is now giving place to a careful study of the requirements of the people. Firms which sell fertilizers are making it their business not merely to open up-country depots but to send out demonstrators to organize demonstrations on the fields of cultivators. The same is true of the dealers in agricultural machinery. Every effort is being made by the more enterprising firms to demonstrate their machinery and convince prospective buyers of their merits, and to follow this up with a service organization to provide the necessary spares. Proposals to facilitate business by introducing the hire-purchase system are also being mooted.

OTHER DEPARTMENTS AND THE DEPARTMENT OF AGRICULTURE

The Department of Agriculture is fortunate in continuing to receive full hearted support from other Departments of Government. In particular the assistance of the Revenue Department should be acknowledged here. Many Revenue Officers from Commissioners downwards have taken an active part in furthering the objects of the Department, of which one example may be mentioned here namely the campaigns to induce agriculturists to adopt the anti-smut treatment for jowar. The most conspicuous service rendered to Agriculture, however, was the work of Mr. Smart, Commissioner, N. D., who devoted an immense amount of time to organizing the Presidency Show at Ahmedabad, in his capacity of Chairman of the Executive Committee.

CHAPTER II

SERVICES RENDERED TO THE PUBLIC

Seed supply.—The largest seed-supply-operations undertaken by the Department are in connection with the cotton crop. These operations have been dealt with in previous reports and it is only necessary to recapitulate them here. In the Surat area we have introduced the well-known hybrid cotton known as 1027 A.L.F. Each year the Department arranges with certain groups of villages to produce seed, under supervision, sufficient to sow about a lakh of acres, and the seed from this area becomes spread through the whole tract. Similarly the improved strain of Kumpta cotton known as Dharwar I has been introduced on a large scale in the Karnatak. Here the Hubli Co-operative Sale Society has been the chief instrument for supplying seed on a large scale. The Department has, however, produced an almost equally good cotton called "D1×D2" which has the important advantage of being wilt-resistant, and it is proposed to make this cotton the standard variety for the Dharwar tract. In the Gadag tract Dharwar-American cotton is the variety commonly cultivated and the improved strain known as Gadag I is being widely introduced. The area sown in the year under report with this variety of seed supplied by the Department or other reliable agency was 139,396 acres. In Khandesh the principal variety so far introduced has been "N.R." an improved strain of deshi. The seed-supply in this tract has not been so well organized as at Surat, Dharwar and Gadag. Only comparatively small quantities of seed are handled by the Department and this is supplied to Taluka Development Associations. The Department has been successful in breeding an improved cotton suitable for cultivation in Khandesh. This cotton has been given the name of "Banilla" and the area sown with it in the year under report was 2,872 acres and arrangements have been made to distribute seed for 25,000 acres in 1929-30. This cotton spins 18s to 20s counts against "N.R." which spins only 10s counts so that it has a far reaching significance to the Khandesh tract. In Sind the improved strain of deshi known as "27 W.N." has reached an area of about 60,000 acres while early American cotton is finding much favour in the Southern Jamrao tract, where the canal has recently been working favourably in the early sowing season. As a consequence the area under 4F. Punjab-American was 35,471 acres against 33,090 acres sown with deshi cotton in the year

under report. Turning to wheat the most successful work has been in connection with the introduction of "Pusa 12" into northern Sind. The popularity of this wheat may be gauged from the following figures :—

Name of Taluka.	Area in acres under "Pusa 12" in 1928-29.	Percentage area under "Pusa 12" to total wheat area sown in 1928-29.
Mirpur Mathelo	4,000	40
Ghotki	6,300	70
Sukkur —	4,200	50
Shikarpur	6,600	60

Seed of improved strains of rice are now being distributed in several centres. Thus in the North Konkan the variety known as Kolamba No. 42 has been widely introduced, and the Department issued seed for 3,300 acres in the year under report. Another popular strain in the North Konkan is known as "Kolamba No. 79." The Department in the year under report issued seed for 150 acres of this strain. In Kanara the Department has introduced two improved strains. The improved strains of rice which have been bred on the Larkana Farm are now being issued in the district. In the year under report the area sown with these improved strain was 247 acres. Improved strains of rice bred at the Mugad Farm in the Dharwar District are undergoing final trials before being distributed to the public. The improved tobacco strain bred at Nadiad, and known as "No. 6" is proving very popular in the Kaira District. Seed sufficient to sow 800 acres was issued in the year under report.

Grading seed.—Very striking results have been obtained from merely grading rabi-jowar seed in the Deccan and a great deal of work has been done with the object of helping cultivators to adopt this very simple but very valuable improvement. Thus in Sholapur District 90 plots sown partly with graded and partly with non-graded seed were arranged.

The average results obtained are summarized in the following table :—

Year.	Yield in lbs. of grain per acre.	
	Graded seed.	Non-graded seed.
<i>Dry Crop.</i>		
1927-28	1,010	737
1928-29	758	458
<i>Irrigated Crop.</i>		
1927-28	1,874	1,564
1928-29	1,030	650

In the year under report the increased yield from graded seed has varied from 30 to 89 per cent. against 26 to 73 per cent. in 1927-28 in the case of the dry crop and from 43 to 77 per cent. against 16 to 25 per cent. in the case of the irrigated crop. The grading is done by hand sieves and 574 of these sieves were sold, and now many cultivators have adopted the practice of grading. In this district about 3 lakhs of lbs. of rabi-jowar seed were found to have been graded, while in the Barsi Taluka alone it has been ascertained that the practice has been adopted in 13 villages to the extent of 12 per cent. of the total rabi-jowar area.

Premium-bulls.—There is a great demand for premium-bulls especially those that are bred at the Chharodi Government Farm in Ahmedabad District. Altogether 38 premium-bulls were issued during the year under report. These consisted of—

Name of breed.	Number of bulls issued.
Kankrej	19
Amrit Mahal	10
Sindhi Red	3
Others	6

Field Embankments.—There are few more popular services rendered by the Department of Agriculture than the work of the “bunding” officers who teach cultivators the right methods of aligning and constructing “tals” or field embankments. There are now four such officers wholly employed on this work. In Bijapur District plans and estimates were prepared for 32 schemes in 21 villages. The estimated cost of these schemes was Rs. 45,144. In addition 22 schemes for the reclamation of small nalla beds were prepared. Formerly executed schemes amounting to 54 in all, were also inspected and advice, where necessary, was given as regards repairs. In the Belgaum and Dharwar Districts 24 small schemes for 29 survey numbers aggregating 440 acres, were prepared. In the Deccan District the bunding officer dealt with the following applications which fall into three divisions :

(a) applications referred by the Revenue Department to the Agricultural Department for tagai-loans for amounts exceeding Rs. 500 which required advice after survey on the height of bund and proper position of waste weir ;

(b) applications from private persons who wished for advice as regards proper alignments of bunds and location of waste weirs and estimates of cost ;

(c) applications from Credit Societies concerning private and joint schemes which required preliminary survey from all aspects. :—

Name of District	Total number of applications			
	Received		Disposed of	
	Revenue Department	Private persons	Revenue Department	Private persons
Poona ..	66	17	38	7
Sholapur ..	77	32	13	7
Satara ..	22	3	11	1
Nagar ..	92	14	5	5

In order to spread correct knowledge among cultivators on the construction of these embankments a class was organized at Barsi for a week in January 1929. This class was well

advertised a month before it was held and thus it was well attended as indicated by the following figures :—

Persons attending the class	Districts from which persons attended the class with numbers						Total
	Poona	Ahmednagar	Satara	Sholapur	Belgaum	J amkhandi State	
Cultivators and Landlords ...	2	3	1	33	3	6	48
Revenue officials such as Circle Inspectors, Patils and Talatis ...	..	..	..	18	..	..	18
Taluka Development Officers ...	..	..	5	5	..	..	10
Agricultural Officers ...	1	4	1	2	..	..	8
Total ..	3	7	7	58	3	6	84

The mornings were devoted to lectures or "talks" while the afternoons were devoted to practical work. The cultivators much appreciated the instructions imparted in this class.

Diversification of crops.—Owing to the unsatisfactory nature of the sugarcane industry in recent years the Department has been giving special attention to the diversification of crops in the canal zone which in the past has depended too much on sugarcane. The two most promising money crops are early cotton and early groundnuts. The "N.R." variety of cotton is proving very successful as an irrigated crop as may be gathered from the marginally noted figures which represent the average results obtained on a series of demonstration plots—even in a year when the season was not very favourable for cotton in this tract.

Name of Canal	Average yield of seed cotton in lbs. per acre.
Nira Left ..	772
Nira Right ..	1,018
Godavari ..	735
Pravara ..	807

The area under this cotton is increasing on all the canals owing to the facilities for early water granted by the Irrigation Department.

The most suitable variety of groundnuts is Spanish peanut, and the Department distributed 18,840 lbs. of seed of this variety in the canal tracts.

Reducing "costs" of production.—Perhaps the chief defect underlying the sugarcane industry in the Deccan is the high cost of production. Cane-growers as a class over-manure their crops regardless of the law of "diminishing return". Thus the cost of producing a maund of stripped cane reaches 12 annas* per maund (of 80 lbs.). So long as this order of magnitude in cost of production persists it is improbable that the Deccan can ever become a sugar-producing, as distinct from a gul-producing tract. Efforts are accordingly being made by the Department to prove that cane can be produced much cheaper. In this connection the figures in the following tabular statement have considerable significance. They represent the average results obtained by adopting the "standard manjri-system", which embodies many economies, at Manjri :—

Year	Average yield of gul per acre in lbs.	Value of gul per acre in rupees	Cost of producing gul per acre in rupees	Profit per acre. in rupees	Remarks	
					Rate of Gul in lbs. per rupee	Cost of hired labour in annas per day per man
1924-25	8,947	1,118 6 0	660 10 6	457 11 6	8	11
1925-26	9,264	926 6 0	635 9 0	290 13 0	10	11
1926-27	9,942	903 13 0	623 13 0	279 15 7	11	11
1927-28	9,950	829 2 8	626 8 0	202 10 8	12	11
1928-29	9,302	885 14 3	593 3 3	292 11 0	10½	10

It is anticipated that it will be found possible to reduce "costs" still further by substituting the variety known as J 213 for the local Pundia variety.

These economies have been widely demonstrated in the canal tracts and several of the items are being adopted by cultivators.

Crop protection.—The Department of Agriculture is now in a position to assist the cultivator in a variety of ways in protecting his crop from sundry pests. First of all there are the great fungus diseases such as smut in jowar. Thus in the Southern Division upwards of 30,000 packets of copper sulphate were distributed mainly through the services of the Revenue Department. This was sufficient to steep seed sufficient to sow over a lakh of acres. In Kanara District the Supari palms are subject to a serious disease called Koleraga. Spraying operations were conducted by the Department in 45 villages in gardens covering 300 acres, and in addition 28 demonstration plots and 12 training classes were organized, while spraying

* Calculated on the basis of hired cash labour.

machines to the number of 12 and spraying materials to the value of Rs. 800 were sold to garden-owners. Insect pests cause an immense amount of damage to crops. One of the most troublesome pests in recent years has been the wingless-grasshopper which has raided the Deccan from Nasik to Dharwar for several years. This pest was so formidable in some of the Nasik villages that bajri-cultivation had to be given up. A very successful method of destroying this pest has been devised by the Department which may be called the "tin-sheet" method. This has been demonstrated on a large scale in Nasik, Satara and Dharwar Districts and the people have taken it up. In Nasik District this method was demonstrated on an area of 500 acres in one block at a total cost of Rs. 491. As a result the villagers themselves dealt with 1,000 acres. In Satara District where a demonstration on an area of 177 acres was conducted the results were very successful as may be gathered from the following tabular statement :—

Treatment	Yield of jowar in lbs. per acre		Value of produce in rupees per acre
	Grain	Fodder	
Protected	486	1,000	27
Not-protected	48	1,000	6½

Wild pigs cause great damage, especially to certain crops, like sugarcane. The Department maintains a Pig-Officer who organises campaigns in the worst affected areas in the Deccan. In the year under report 141 pigs and 4 panthers were destroyed at an average cost of Rs. 5-3-9 per head, and 17,575 acres of crop were protected. In the Southern Division fencing has been successfully introduced against pig. There are now a number of successful Societies. In the year under report the Department imported and sold 10 miles of wire fencing material. A third method of fighting pig which has proved successful in the Southern Division has been a series of campaigns to remove prickly pear which harbours them. In all prickly pear standing on 125 acres of Government land and 116 acres of private land has been removed. For this purpose a tagai-loan of Rs. 14,400 was obtained out of which Rs. 8,330 has already been paid off. The total area estimated to be protected is 46,000 acres in six groups of villages in Mundargi Petha of Dharwar Taluka. In Ron Taluka of Dharwar District where wild deer cause immense damage campaigns were organized

in three villages where 200 deer were destroyed. The Rat-destruction operations with cyanogas dust were conducted over an area of 6,543 acres in South Sind in the year under report.

Mechanical assistance.—Apart from boring referred to below the Department is constantly approached for advice and assistance in connection with the purchase and erection of machinery. The two principal types of machinery adopted by agriculturists are :—

- (a) pumping plants, and
- (b) cane-crushing plants.

Thus in the Karnatak the Mechanical Assistant inspected sites and prepared plans and estimates for 16 pumping plants (6 in Dharwar, 4 in Belgaum and 6 in Bijapur Districts). Ten of these pertained to wells and six to rivers. This officer also erected two pumping plants, one at Yerdal in Sampagaon Taluka of the Belgaum District and one at Bijapur, both on wells.

In the Deccan the Mechanical Assistant erected four cane-crushing plants at the marginally noted centres. These plants consisted of Chatanooga mills of the "92" and "44" types and Blackstone engines ranging from 11 to 26 B.H.P. He also erected pumping plant on a well at Bawada in Poona District. The number of power cane-crushing plants on the Deccan Canals is now reported to be 57. In addition to erection work this officer visited 15 existing crushing plants and seven existing pumping plants and rendered help. Another useful piece of work done by this officer was assisting cultivators to correct the mistakes made by local engineers where these had been employed to erect machinery. Thus the foundations on which engines had been erected at Rahata in Ahmednagar District and at Koregaon and Charegaon in Satara District, were corrected. In addition he visited 28 wells and river-sites to give advice regarding the installation of pumping plants. In Gujarat the post of Mechanical Assistant was vacant for some time but in the course of the year five pumping plants were erected for the public.

These Mechanical Assistants take higher advice and assistance from the Agricultural Engineer to Government. In the year under report that officer received 138 technical enquiries of which 42 were for pumping plants, 56 for boring, 11 for tractor-ploughs, 6 for cane-crushers, 3 for the new

seed-drill and 20 for miscellaneous machinery. During the course of the year the Agricultural Engineer hired out five pumping plants in addition to other two hired out in the preceding year.

Boring.—The Department of Agriculture has been assisting the public for over 20 years to increase the water supply in their wells and a recent computation showed that 187,410 feet had been bored and about 3,022,886 gallons per hour had been added to the wells of the Presidency. In the year under report there were 24 boring machines working under the direct control of the Agricultural Engineer and 28 machines working under the five Presidency Deputy Directors of Agriculture. Altogether 254 bores were made resulting in the tapping of 95,011 gallons of water per hour.

Water-finding.—The Department possesses four water-finding machines, of which two were associated with the Water Diviner, Major Pogson. During the year under report 413 sites were tested for the public the usual practice being to test five or six sites at each centre, and 105 sites were located where under-ground water might be expected. It is often difficult to obtain subsequent information as to what action, and with what success, the owners of these sites have taken. Information as it became available has been published in bulletins Nos. 72 and 152 of the Bombay Department of Agriculture. In the case of the year under report information has come to hand about 10 wells which have been dug on sites included in the list of 105 sites mentioned above. In eight cases satisfactory results have been obtained while in two cases the success is doubtful.

Horticultural assistance.—Interest in fruit-growing is widespread throughout the Presidency as is evidenced by the fact that 738 enquiries regarding fruit cultivation were received in the course of the year from the public. The District horticultural staff has been very fully occupied in assisting owners of fruit trees to improve their property, for example in the budding of country bor trees and the grafting of country mango trees, the treatment of orange orchard for "die-back" disease and the control of grape mildew by sulphur dusting.

Poultry assistance.—The magnitude of this industry is not always appreciated. Bombay alone consumes a lakh of eggs per day. The Department has now taken up, on a small scale, the practical support of this industry. During the year under report a large number of eggs of good breeds have been issued to selected persons for hatching, while male birds have been

issued to selected villages. The demand is very keen and proposals are before Government for expanding these operations.

Chemical assistance.—A large number of samples are received by the Agricultural Chemist from the public for analysis and advice based on analysis. In the year under report 501 samples were received from the public, as shown in the margin.

Soils ..	52
Manures ..	149
Waters ..	76
Feeding-stuffs ..	53
Gul and Molasses ..	107
Miscellaneous ..	64

Training classes for adults.—It has been found that training classes for special subjects are much appreciated by the public. In former reports mention has been made of the sugarcane classes and the horticultural classes and on pages 9 and 10 of this report a brief description is given of the Land-Development Class held at Barsi in January 1929. A fourth type of class is the "Oil-engine class" which is conducted by the Agricultural Engineer to Government. In the year under report there were 78 applications from cultivator-students for admittance to this class, of which only 30 could be admitted. It is thus evident that an enlarged organization has become necessary for the conduct of this class. This class lasts for three months and four classes per annum are held.

CHAPTER III

AGRICULTURAL RESEARCH

Future plans.—One of the great services of the Royal Commission on Indian Agriculture was to place Research in its proper position in the activities of the Department of Agriculture. During the past 20 years there have been very few agricultural officers of standing in any of the Provinces of India, who were free to devote their whole energies to Research. The exigencies of circumstances required most of the staff of the Departments to deal with education, propaganda and administration as these activities could not be left undone if the public were to be impressed by the Departments of Agriculture.

The launching of the Imperial Council of Agricultural Research marks a fundamental step forward. Henceforward it is expected there will be a corps of talented scientists devoting themselves wholly to research, undistracted by teaching and other time-absorbing duties. It is anticipated that there will soon come into being a Bombay Provincial Committee of Research to collaborate with the Imperial Council, and

plans are already being made to prepare schemes for the consideration of these bodies.

Owing to financial stringency it is not at present possible to set up well-equipped agricultural research stations but I look forward to the day when the Bombay Presidency will possess several such institutions. The Deccan must have its "Rothamsted" and likewise Gujarat, not to mention the Karnatak. Sind in this respect will lead the way as it already possesses the Sakrand Research Station, and the importance of Barrage-irrigation is likely to lead to the establishment of two more Research Stations one in West Sind and one in East Sind.

In the Presidency proper one of the greatest problems demanding real undamental research, is Deccan Irrigation which at present is a burden on the general tax-payer. A well-equipped Agricultural Research Station to deal with this problem is overdue. It has been suggested that this Station should be located somewhere on the Right Bank Nira Canal, the latest and largest irrigation work of the Deccan. In the meantime pending an improvement in the finances of this Presidency it seems desirable to set up in skeleton form a Deccan Agricultural Research Institute, if not in bricks and mortar at least in men. The Imperial Council of Agricultural Research is willing to support any well-thought-out scheme and accordingly proposals are being worked out on these lines.

Plant-breeding.—Turning now to the year's work in research reference may be made to some of our latest improved strains of crops. Thus in Sind certain strains of wheat, namely, "C.Ph. 47" and "A.T. 38" have proved to be very prolific, in this respect surpassing Pusa 12; but the fact is being kept steadily in view that the future wheat of Sind should, if possible, be such as to command a world-market and be comparable to the best Canadian wheats, and experiments are now in progress with Manitoba wheat to ascertain whether it can be acclimatized or at least utilized as a parent in hybridization work. At Larkana certain high yielding strains of rice have been evolved, and attention is now being paid to the question whether under the new irrigation conditions later varieties possessing higher quality should be aimed at. In the Konkan a very desirable new strain known as "No. 401" has been bred at Karjat. It possesses very fine grain which commands a good valuation. This variety may prove very useful for the substitution of the coarse varieties now grown on the high-lying fields. In the Karnatak the Department has been fortunate in breeding a hybrid cotton which has practically as good fibre properties as

the well-known "Dharwar 1" but is strongly wilt-resistant. It is proposed to replace "Dharwar 1" with this new variety which is called "D 1 $\times$ D 2." In Khandesh the Department has bred a new cotton which is called "Banilla". This cotton spins 18s to 20s against the 10s of "N.R.", a fact full of significance to Khandesh. It is expected that 25,000 acres will be sown with Banilla in 1929-30. Progress is also being made with tobacco-breeding at Nadiad, bajri-breeding at Poona, Nagli-breeding at Ratnagiri and Jowar-breeding in Sind. The highly important crop of rabi-jowar in the Deccan which extends over 36 lakhs of acres has not yet been tackled but it is next on the list.

Dry-farming.—The problem of conserving the rainfall still remains the master-factor in the improvement of agriculture over the greater part of the Presidency. Hence the research work of the Soil-physicist has great significance. The methods worked out by that officer are now being tested on a large scale under cultivators' conditions, and there seems reasonable ground to infer that some of his methods, which are practical under village conditions, do lead to a very substantial increase in yield. Figures in support of this view will be found on page 208 of this report.

Alkaline soils.—The Soil-physicist at Sakrand is investigating several aspects of the problem of alkaline salts in alluvial soils. In order to obtain fundamental data a careful soil-survey has been made of the Sakrand estate, and it has been found that most of the area contains soluble salts ranging from 1 to 2 per cent. of the soil, while some portions contain as much as 7 to 8 per cent. Analyses indicate that the highest percentage of salt is usually contained in the top one-foot of the soil in cultivated land, while it gradually decreases with depth, but there are conspicuous exceptions to this rule. Sodium chloride and sodium sulphate are the predominant salts. The Agricultural Chemist at Poona has investigated the assimilation of plant-food by the rice-plant at Karjat and has published a bulletin under the title "Assimilation of food constituents by the rice-plant". He is now turning his attention to the problem of "Karl lands" in the Karnatak which in the aggregate occupy such a large area and on which crop-growing is so difficult.

Cattle-breeding.—The main cattle problem in the Bombay Presidency is to give the cultivator a better drought animal, and where this can be combined with a better milk-output this object is also kept in view.

Breeding with more than one object in view is, however, liable to lead to compromise in animals, where the principles of genetics are more difficult to apply owing to the relative smallness of the numbers of individuals dealt with. It is therefore imperative that no risks shall be run through using breeding-stock which are defective in important draught qualities, because the maxim that there is nothing so difficult to breed-out of (*i.e.*, eliminate from) a horse-family than bad legs, probably applies with equal force to draught cattle. Hence it must always be borne in mind that a little more milk in his cow is no compensation to a ryot for bad legs in his plough-cattle.

The most important cattle breeding farm is called "The Northcote Cattle Farm, Chharodi" where the cattle belong to the Kankrej breed. Some splendid animals were exhibited at the Presidency Show at Ahmedabad in November 1928. Some of the cows on this farm are now yielding over 4,000 lbs. of milk per lactation. The best animal "Ravati" yielded 5,866 lbs. in 414 days, while "Meghan" yielded 4,889 lbs. in 336 days. At the Willingdon Cattle Farm at Pihai near Karachi the breed is "Sindhi Red", the most famous milch breed in Asia. In the year under report one cow yielded 7,500 lbs. per lactation, two cows yielded 7,000 lbs., three cows 6,000 lbs. and ten cows 5,000 lbs.

Plant pathology.—In Plant-pathology good progress is being made in several lines of research. The substitution of sulphur dust for Bordeaux spray as a preventive of mildew on grapes has proved very successful, and the Nasik grape-growers are highly appreciative. This investigation will shortly be published in a Departmental bulletin. The well-known process of steeping Jowar-seed in copper sulphate is also being replaced by sulphur dust with excellent results. The Mosaic disease of chillies which devastates this crop all over the Deccan, forms the subject of a very interesting piece of research. This disease which reveals itself by the curling, mottling and reduced size of the terminal leaves, is a type of virus disease. That is to say the causal organism is so small as to pass through a filter and remains unseen under the strongest microscope. It has now been proved that the vector (or carrying agency) is an insect of the thrips family. Wilt-disease in cotton is now assuming alarming dimensions in certain parts of the Presidency. A Research Scheme is in progress at Dharwar, financed by the Indian Central Cotton Committee. So far the most promising method of dealing with this disease is through

breeding resistant strains of cotton and considerable progress has been made on these lines.

Plant physiology.—The Indian Central Cotton Committee have provided funds to finance two research schemes connected with cotton-physiology. The first pertains to the shedding of the bolls of the cotton plant and is being conducted at Surat. Nitrogenous manures applied in such a way as to be effective at certain critical periods in the plant's life appear to have a marked effect in diminishing this shedding and consequently increasing the yield. This treatment is being tested on an extended scale. The other scheme is being conducted at Sakrand, and it is designed to throw light on the extent to which the principal environmental factors affect the success of the crop and the best means of exercising control, where control is possible, as for example the quantity of irrigation water used and its method of application and the date of sowing. One very significant point brought out by the work of the year under report, is that the non-dehiscence of the anthers plays a big part in the yield of the crop, particularly as regards the distribution of the yield during the season. This is found to be a variable factor with locality. Thus the anthers of early formed flowers non-dehiscence at Sakrand, while they dehisce normally at Mirpurkhas. If this is confirmed it means that early sowing is better worth while in East Sind than in Middle Sind.

Soil fertility.—Maintaining the fertility of the soil in Sind under perennial irrigation with a negligible organic-manure supply, is a problem of immense importance. Experience shows that the land has a strong tendency under constant irrigation to deteriorate in physical condition, in other words to fall into bad "heart". This becomes intensified if alkaline salts are present. The cropping scheme presumed in the Lloyd Barrage Project Report does not appear to meet this difficulty and accordingly the Agricultural Section at Sakrand is investigating alternative systems of agriculture designed to solve this problem. A series of 16-acre holdings have been laid out in two of which the Project Report System is being tested on "sweet" and alkaline land respectively in comparison with four possible alternative systems designed to suit varying conditions of soil. Egyptian clover (berseem), a fodder crop, plays a "key" part in these alternative systems, and should they be adopted on a large scale it would become necessary to assess this crop at a figure which will bring in a reasonable revenue to Government. This crop should be able to bear such assessment if some type of animal-husbandry can be

introduced such as dairying or sheep-farming. In such circumstances an assessment of Rs. 3 per acre might be levied. On this basis the following tabular statement has been prepared to indicate the revenue which Government would derive from one cusec of water under the different systems.

Probable Revenue in rupees to Government per annum per cusec of Water supplied under different systems of Agriculture on trial at Sakrand

	Lloyd Bar-rage Project Report	Sakrand "A"	Sakrand "B"	Sakrand "C"	Sakrand "D"
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Cotton	300 12 0	325 0 0	438 5 0	325 0 0	390 10 0
Jowar	162 12 0	200 0 0	138 5 0	200 0 0	92 8 0
Gowar	11 1 0	....	....	....	69 6 0
Gram	22 2 0	....	....	....	....
Wheat and Oil seeds	666 0 0	....	200 0 0	300 0 0	624 0 0
Barseem .. .. .	....	300 0 0	250 0 0	225 0 0	138 12 0
Total	1,223 10 0	825 0 0	1,016 10 0	1,050 0 0	1,225 4 0

CHAPTER IV

AGRICULTURAL PROPAGANDA

The importance of well organized propaganda by the Department of Agriculture has long been recognized, and this work is being steadily pushed on in practically every taluka of the Presidency. The various methods adopted have been fully described in previous reports and need not be repeated here but a new type of intensive propaganda may be referred to. At the suggestion of Mr. A. M. Macmillan, Collector of Ahmednagar, a plan has been worked out for conducting mass propaganda in his district in the ensuing year. The programme will be confined to three or four proved improvements such as seed-grading and dry-farming methods. These will be demonstrated on land at all important bazaar and market centres and officers will explain the advantages to be derived from their adoption, on bazaar days. Propaganda in order to penetrate into every corner of the Presidency must be largely non-official. The chief non-official agency is, of course, the taluka development association. Owing to financial stringency no new associations have been launched in the year under report, but there are in all 82 associations. The Government subsidy, which is limited to Rs. 1,000 in each case, amounted to Rs. 59,094 in the year under report.

These associations vary considerably in quality but many of them are doing good work. Thus in the dry tract of the Deccan the Madha Association undertook the grading of jowar seed and graded 31,000 lbs. in 26 villages. It also distributed 2,288 packets of copper sulphate for steeping the seed as a preventive of smut disease, and it has been instrumental in introducing 200 improved seed-drills during the last few years. It also undertook the duty of supervising the Co-operative Credit Societies. In the Karnatak the Haveri Association distributed 122 bags of fertilizers, while the Chikodi Association sold 40 tons of Sulphate of Ammonia. In the North Central Division (Khandesh and Nasik) all the 22 associations are reported to be doing good work. Among these associations Jalgaon, Pachora, Amalner and Bhusawal are showing great enthusiasm in introducing the new cotton bred at Dhulia, called "Banilla". This cotton spins 18s to 20s against 10s by "N. R." cotton. In Gujarat the Anand and Borsad associations are concentrating on the spread of the improved Tobacco variety known as "No. 6". In Sind these associations are largely engaged in seed distribution. Thus in Ghotgi Taluka the area under Pusa 12 wheat represents 70 per cent. of the total wheat area of the taluka.

Mention should be made of the experiment in Satara District of placing all propaganda, including the control of taluka associations, under the control of the Local Board. The Department has lent an experienced agricultural officer, as well as some lower staff, to the Local Board to control the work, and the scheme appears to be working satisfactorily.

The Divisional Boards of Agriculture which control all propaganda work subject to the Joint Board of Agriculture continue to do useful work and the services of the non-official members of these boards are worthy of commendation.

SHOWS AND DEMONSTRATIONS

Mention has already been made of the great success of the Presidency Agricultural Show at Ahmedabad, and it is gratifying to report that several excellent District Shows, largely modelled on the Presidency Show-design but on a smaller scale, were also held during the course of the year. The most important were—

- The Bijapur Show.
- The Ahmednagar Show.
- The Jalgaon Show.
- The Jacobabad Show.

The Bijapur Show, which was opened by the Commissioner, Southern Division, extended over three days and was attended by very large crowds.

The special feature of the Ahmednagar Show was the demonstration plots in which crops were grown by improved methods and raised from graded seed. The differences in the appearance of the plots were very striking. At Jalgaon also the special feature of the Show was the Crop-Court. This Show was attended by 15,000 visitors. Tractor demonstrations were the special feature of the Jacobabad Show.

In addition to organized Shows a very large number of demonstrations were conducted throughout the Presidency and Sind. Many of these were associated with Jamabandi. Similarly large numbers of demonstrations were conducted on cultivators' fields. Tractor demonstrations were organized in Sind on an extensive scale. Thus a tractor unit toured through Hyderabad District starting from Saidabad on the 10th November and stopping at Tando Allahyar on the 23rd December. It covered a road distance of 161 miles and gave exhibitions of ploughing at a dozen centres, ploughing 90 acres in all.

CHAPTER V

SPECIALIST SECTIONS

Apart from the Botanical, Chemical, Agricultural Economics, and other sections attached to the College of Agriculture, which are mainly devoted to teaching, the Department possesses several other sections which are not primarily concerned with teaching. These deal with

Livestock,
Engineering,
and
Horticulture.

Each of these sections is controlled by a specialist officer of Imperial Service rank or its equivalent.

LIVESTOCK

The work of this section is mainly confined to cattle improvement, but more recently it has taken up poultry, and proposals are before Government to initiate work on sheep and goats. Some reference to the work of this section will be

found in both the chapters dealing with Service and Research. The concentration scheme recommended by the Cattle Committee of 1923 has now been introduced in skeleton form. The essence of the scheme is to divide the Presidency for cattle breeding purposes into two divisions—one to be worked by the Livestock Expert and the other to be worked by the Territorial Deputy Directors :—

- I. Areas specially suitable for cattle breeding.
- II. The rest of the countryside.

As regards I there are seven such localities which it is proposed to call

Intensive Breeding Zones

These are as follows :—

Serial number	Name of Zone	Constitution of Zone	Headquarters of Zone	Name of breed
I ..	Chharodi ..	Virangam Senand Prantij Dholka South Das- kroi. } Talukas ..	Chharodi ..	Kankrej.
II ..	Surat ..	Olphad Chorasi Jalalpur } Talukas ..	....	Kankrej.
III ..	Satpura ..	Shirpur Shahada Sindheda Nandurbar } Talukas ..	"	Tapti Khi- lari.
IV ..	Sholapur ..	Pandharpur Malshiras Sangola Man } Talukas ..	Pandharpur ..	Mhaswad Khilari.
V ..	Nasik ..	Akola Igatpuri Shahapur Murbad } Talukas ..	....	Dangi.
VI ..	Belgaum ..	Athni Chikodi Hukeri Gokak } Talukas ..	....	Krishna Valley.
VII ..	Bankapur ..	Bankapur Karegi Ranebenmur Hangal } Talukas ..	....	Amrit Ma- hal.

At present there are only three officers available to take charge of these seven zones, but the work is still on a very small scale in some of the zones.

Pending further developments it has been decided to allot these zones as follows among the three Divisional Inspectors for Cattle Breeding with effect from the 1st April 1929 :--

I and II	.. Chharodi and Surat ..	.. Divisional Inspector for Cattle Breeding at Chharodi.
III, IV and V	.. Satpura, Sholapur and Nasik ..	.. Divisional Inspector for Cattle Breeding at Pandharpur.
VI and VII	.. Belgaum and Bankapur ..	.. Divisional Inspector for Cattle Breeding at Dharwar.

The Livestock Expert will devote his time and that of his staff to (a) breeding pedigree bulls at his farms and supplying them on the premium system to the villages in the Intensive Breeding Zones. For distinction these will be called "A Class" bulls. The premium bull stock, that is the off-spring of the premium bulls, will be specially watched, and suitable males will be earmarked (by the tatoo method) to be supplied as "B Class" premium bulls to the Territorial Deputy Directors for the improvement of the cattle in their respective circles. In this way cattle improvement will be a joint effort by the Livestock Section and the territorial or general section, and the heads and sub-heads of these sections will frequently confer so as to ensure that the operations are carried out according to an agreed policy with regard to such matters as the type of animal required in the country side. The Deputy Directors are likely to insist upon a "tillage-type" rather than a "milk-type" without excluding milk altogether. For this reason they are likely to favour animals which fulfil their ideas with regard to such qualities as "size" and "action". They will want animals with good feet and legs, which are "straight-in-front", which possess well-positioned hocks and which have hock-action resembling that of a horse.

In their respective circles, after excluding the "Intensive Breeding Zones", the Territorial Deputy Directors will carry out all cattle improvement work, taking such advice as they deem fit from the Livestock Expert, including propaganda, the issue of bulls, and the inspection of bulls and their off-spring. The intention is that the "B Class" bulls shall be obtained from the Intensive Breeding Zones, through the assistance of the Livestock Section.

The Livestock Section devotes considerable attention to the feeding problem, and silage making has been demonstrated in a number of centres.

ENGINEERING

This subject has been largely dealt with under service above on page 13 *et seq.*

The new seed drill was exhibited at Ahmedabad Show, and many useful suggestions were received for its further improvement. These have now been tried and adopted where suitable. It is now being proposed to give a firm permission to manufacture this drill. The Agricultural Engineer has further perfected the winnowing machine, a recent test of which indicates that it can winnow 1,000 lbs. of jowar bhusa per hour at a cost of five annas.

The Presidency Show at Ahmedabad placed a very heavy burden on the Agricultural Engineer and his staff, but the splendid form which the Machinery Section of the Show assumed, fully rewarded him for his efforts. Mention has elsewhere been made of the popularity of the Oil Engine Class for which there were 78 applications from cultivator candidates. There is now a demand from the Trade that the Department should organize tractor classes to train drivers as the driver-problem

1. The Dharwar Agricultural Association.	is one of the biggest obstacles in the way of introducing tractor cultivation.
2. The Bijapur Anti-Famine Institute.	This is undoubtedly one of the reasons why the three tractors which are being operated by the marginally noted public authorities are not giving better performances.
3. The West Khandesh District Local Board.	

HORTICULTURE

This section conducts its operations at the Modibag (included in the College Estate) and at Ganeshkhind Gardens. The Department has also a Fruit Farm at Mirpurkhas in Sind. The work of this section has also been referred to in the chapters which deal with Services and Research. The work on lime-juice manufacture, the preparation of fruit jellies and the preservation of the "bor" is now ready for publication. Such work, however, is greatly hampered for want of a well-equipped laboratory, but proposals are now before Government to provide this need. Work on fruit in the Presidency is confined mainly to mangoes, citrus fruits, grapes, figs, bananas, guavas and pomegranates.

A special study is being made of stocks suitable for citrus fruit. The troublesome "Die-back" disease of this fruit is

still under study, but a bulletin on the subject has been published. The marketing of mangoes is receiving special attention, but this problem is dealt with in the chapter on Marketing. A special research scheme financed by the Sassoon David Trust is being conducted at Ratnagiri in connection with mango blight. Proposals to assist the canning industry in the Konkan are under the consideration of Government. The work at Mirpurkhas received a severe check owing to the frost wave in January-February 1929. The most promising fruits in Sind are dates, lemons and raisin-grapes, and special attention is being paid to them at Mirpurkhas.

CHAPTER VI

AGRICULTURAL ECONOMICS

MARKETING

The Royal Commission on Agriculture have made out a very convincing case for the appointment of a Marketing Officer, and proposals to give effect to this recommendation are before Government. There can be no question that marketing disabilities strangle the advancement of agriculture to an extent which cannot be exaggerated. This is well illustrated by the fact that the hybrid cotton "1027 A.L.F." although it has been grown on an extensive scale, in a very fairly pure condition, for many years, still fails to secure its intrinsic value. Indian Mills purchase the lots which are certified to be pure by the Department of Agriculture at a premium of about Rs. 20 per candy over the price paid for an admittedly inferior cotton known as "1A". The latter cotton is not so to speak "a dark horse." The same mills which have spun it before buy it again so that the millowners know what they are getting. They also know what they are getting, from past experience, when they buy pure "1027 A.L.F." grown in the seed-growing villages specially controlled by the Department of Agriculture. Still they only differentiate to the extent of Rs. 20 per candy, and this cannot be explained away on the ground that the parcels are too small to command their intrinsic values. Hence it is fair to infer that either "1027 A.L.F." is under-priced or "1A" is over-priced.

A repetition of this experience is occurring in Khandesh where the well-known "N.R." cotton spins only 8s to 10s. In this tract the Department is introducing an improved strain, recently designated "Banilla". This cotton spins 18s to 20s. In the year under report the extent of

encouragement given by the mills was a premium of Rs. 20 over the price of ordinary Khandesh cotton.

In another direction progress is more promising. Steps are being taken to introduce regulated Cotton Markets under the Bombay Cotton Markets Act of 1927. These regulated markets are designed to eliminate the abuses which have crept into the kapas or seed-cotton markets in the mofussil and to ensure that the cotton grower shall receive all that he is entitled to. It is proposed to organize the Dhulia market on these lines in the first instance. One of the great obstacles which lies in the way of introducing improved strains of crops on a large scale, is the fact that growers entangle themselves with financiers in order to finance their "standing-crops" and thereby cease to be free agents with regard to the disposal of their produce. Co-operative-finance is intended to assist the cultivator to emancipate himself from the money-lender, but unfortunately the principles of Co-operative finance are too rigid to make such finance available on the security of the "standing-crop," which is accepted as security for advances by the money-lender. In the Surat area the Department has for many years had an organized seed-multiplication scheme comprising 10 to 11,000 acres of cotton and the cultivators require advances aggregating about one lakh of rupees in December to meet current expenditure whereas the crop does not come on the market until March-May. Co-operative-finance cannot function in these circumstances, and hence the money-lenders (in this case mostly gin-owners) secure control over the crop, and the growers lose their freedom to dispose of their crop in such a way that the Department of Agriculture can with certainty recover the seed for extended further distribution. In the Dharwar area finance has also been hampering the extension of improved cottons over extended areas. In this case the Hubli Cotton Sale Society has been financing the cultivation of an improved strain of cotton, but the area is seriously contracting instead of expanding because the growers are unable to obtain all the finance they require from Co-operative Societies, whether Credit or Sale, and so they have to borrow from money-lenders with the condition that they sell off their seed-cotton to those people from whom it is difficult to recover the seed for expanding the area.

There is thus a great need for devising ways and means for adapting Co-operative-finance to the customs of the country,

and more particularly accepting the "standing crop" as a security, if not from all at least from approved growers.

STATISTICS

In accordance with a long-felt want and in consonance with the recommendation of the Royal Commission on Indian Agriculture, proposals have been placed before Government to create a post of Statistician in the Department. Until this post is created it will be impracticable to reform the statistical work of the Department. That this is urgently required is clear from the highly unreliable forecasts which are at present prepared by District Officers. This may be exemplified by contrasting the area figures reported in March and July for the same cotton crop sown in the preceding year. The following statement is significant :—

Name of District	Cotton acreage of 1928-29 crop reported in		Difference
	March 1929	July 1929	
Surat	166,215	191,369	25,154
East Khandesh	728,978	790,406	61,428
Ahmednagar	241,270	257,009	15,739
Bijapur	640,325	745,661	105,336
Belgaum	273,967	327,859	53,892
Dharwar	721,814	766,006	44,192
Thar and Parkar	169,679	185,592	15,913

It should be comparatively easy to report correct figure of area. It is more difficult to be correct with the anna valuations. The following figures are interesting as showing that whereas in Gujarat the anna valuation was much below the mark, in the Karnatak it was much above the mark.

Name of Zone	Anna valuation of 1928- 1929 Cotton Crop	Number of full pressed bales			Remarks
		Fore- casted	Actually pressed	Difference	
Gujarat .. { Ahmedabad .. Kaira .. Panch Mahals .. Broach .. Surat .. Ahmednagar ..	5.0	137,367	225,463	+ 88,096	*Although the Zones are called East Deccan and West Deccan the figures given here refer practically to the Karnatak.
East Deccan*.. { Sholapur .. Bijapur .. Poona ..	9.7	200,835	121,827	- 79,008	
West Deccan*.. { Satara .. Belgaum .. Dharwar ..	9.3	251,645	114,370	- 137,275	

FINANCING THE CULTIVATOR

The marginally noted Enquiries into the finance of the cotton crop up-country, financed by the Indian Central Cotton Committee and carried out jointly by the Bombay Department of Agriculture and the Indian Central Cotton Committee, have now been published. The thoroughness of these investigations has been much appreciated, and they set up a standard which might well be adopted in all serious economic studies that may be undertaken in connection with agriculture in India. The Sind Enquiry Report indicates that the cotton grower in Sind is hopelessly embarrassed financially as he has to hand over practically the whole of his cotton crop to the money-lender, but the position is not so bad as it looks. An experienced Revenue Officer commenting on this matter has pointed out that only 25 per cent. of the debts of the cotton-grower pertain to preceding seasons so that the heavy borrowings are mainly incurred to finance the current crop and are not taken to liquidate old debts.

Sind.
Middle Gujarat.
North Gujarat.
Khandesh.

LEGISLATION

The Cotton Transport Act is working smoothly but it has not been applied to the extent it should be. Thus in South Gujarat the very valuable cotton known as "1027 A.L.F." remains unprotected from the relatively inferior variety known as "I.A." There are now 20 road nakas established to prevent cotton entering the protected areas in the south of the Presidency. There is reason to believe that the type of naka set up is too cheap an agency to serve the purpose in view, as instances of the men in charge being absent from duty have come to light. A few cases of cotton having been imported without licenses into the protected areas have come to light, and the authorities have taken or are taking suitable action. Thus a fine has been imposed in two cases in the Karnatak, which have been investigated, but appeals have been made to the High Court. Arrangements are proceeding for the establishment of a new protected area in Middle Gujarat to be called the Narbuda-Mahi Area.

One significant sequel to the application of the Cotton Transport Act has been the development of malpractices such as watering cotton in the Karnatak, where mixing with imported inferior cotton has been prevented. Hence it may

become necessary to supplement the Transport Act with further legislation.

The Gins and Pressing Factories Act is serving one very useful purpose and that is in regard to agricultural statistics. Thus it was feared that the frost wave which swept over Gujarat at the end of January had wiped out the crop to a large extent, but the Press figures do not bear out that conclusion as may be gathered from the following figures :—

Year	Number of full-pressed bales reported in the Gujarat zone	
1927-28 ..	282,671	(of 400 lbs. each).
1928-29 ..	226,705	do.

It is true that the crop especially in Surat was, in the year under report, expected to be a very heavy one and hence part of the damage may be concealed by these figures.

The Bombay Cotton Markets Act.—The Rules framed under this Act have now been published prior to final sanction by Government, and arrangements are in train to establish a regulated cotton market at Dhulia in the ensuing season. It may also be found possible to establish one such market in Gujarat and one in the Karnatak.

CHAPTER VII

AGRICULTURAL EDUCATION

The Poona College of Agriculture.—This Institution continues to be very popular. The number of applicants for admission in 1929-30 was 220, but 92 of these applications were rejected, mainly for lack of accommodation. The Principal points out in his report—*vide* appendix B—that students from the landed aristocracy and sons of large landowners now form a definite and growing group in the College. The number of candidates who appeared for the final examination for the degree of Bachelor of Agriculture held in March 1929 was 79, of whom 60 passed, one man securing a “first-class”.

Rural Education.—The problem of reorganizing the agricultural schools so as to make them less expensive and better adapted for the purpose in view, is receiving careful consideration. The general principle underlying such schools in some countries is that which may be called “earning while learning”. If the sons of peasant farmers are to be attracted, it seems essential that they should not be a burden on their

parents, particularly as the parents lose the labour of their sons, which is one of the chief reasons why children in this country are withdrawn from school before they complete the ordinary primary school curriculum. The cost of feeding a boy at one of our schools is about Rs. 6 or 7 per mensem and if a plan could be devised whereby the boy could earn this amount he would become almost self-supporting while undergoing the school course. This might possibly be achieved by devoting the whole of the forenoon, say 3 or 4 hours, to work which is paid for, *e.g.*, weaving, cotton picking, weeding, etc. This would mean a wage of about 1 anna per hour and a big boy should be able to earn that amount. The afternoons would be devoted to instruction in such useful subjects as horticulture, oil-engine management, embankment-work, gul-manufacture, seed-grading, etc., etc. Most of this instruction should take a practical form, while purely class-room work would be reduced to a minimum. This system would require a new curriculum and boys of a somewhat older age, who had already learnt arithmetic, geography, etc., would be preferable.

The following table summarizes the working of the six agricultural schools in the year under report :—

Language	Name of School	Number of boys
Marathi ..	1. Loni (Poona District) ..	39
	2. Dhulia (West Khandesh) ..	31
	3. Jambul (Thana District) ..	20
Kanarese ..	1. Devi-hosur (Dharwar District).	26
Gujarathi ..	1. Godhra ..	23
	2. Surat ..	31

Bias Schools.—These schools are still struggling against certain inherent disabilities, *e.g.*, (1) there is no training school for the teachers, (2) there is a good deal of lack of sympathy among the lower personnel of those responsible for primary education and (3) control has passed into the hands of District Local Boards.

It seems that a scheme designed to reform village education should be organized on lines analogous to those adopted for reforming village finance. The counterpart of

an active sympathetic officer, like the Registrar of Co-operative Societies, appointed to foster the movement and remove obstacles, might achieve great results. The Inspector of Agricultural Schools continues to give the Educational Department and Local Boards as much advisory assistance as he can in conducting these schools.

CHAPTER VIII

FINANCE AND ADMINISTRATION

FINANCE

The expenditure of the Department amounted to Rs. 18,28,300 during the financial year 1928-29 as against Rs. 17,08,600 in the previous year. The receipts amounted to Rs. 2,92,400 as against Rs. 2,59,700 in the previous year.

As regards the Personal Ledger Account, which is used for

	Rs.	financing seeds, implements, etc.,
1. Bombay Gujarat Scheme.	29,000	the total amount advanced was
2. Bombay Dharwar Scheme	27,655	Rs. 1,54,804 while the recoveries
3. Earias Boll-worm Scheme	17,350	credited during the year were
4. Khandesh Cotton Breeding Scheme.	5,000	Rs. 1,69,708. Subsidies were
5. Sind Cotton Research Scheme.	20,738	received from the Indian Central
6. Finance of the Cotton crop in Khandesh.	nil.	Cotton Committee for the
7. Finance of the Cotton crop in Middle Gujarat	nil.	marginally noted schemes to
8. Cotton Finance Enquiry in Sind.	300	the amount of Rs. 1,00,043.
	1,00,043	The expenditure during the year
		amounted to Rs. 1,00,548. The
		excess was recouped during the
		succeeding year.

The following amounts were received during the year from the Sir Sassoon David Trustees :—

(1)	Rs. 2,254	for investigations in connection with the improvement of grazing lands.
(2)	„ 5,760	for investigations in connection with drought resisting crops, especially bajri.
(3)	„ 5,000	for the investigation of the Mango-blight problem.
(4)	„ 3,000	for the jowar borer research.
(5)	„ 2,500	for the testing of new nitrogenous artificial manures.
(6)	„ 2,000	for the construction of an incubator house and the purchase of new stock for the Central Poultry Farm.
Total..Rs. 20,514		

ADMINISTRATION

The post of the Director of Agriculture was held by Mr. T. F. Main, throughout the whole year. He also directed the work of the Sakrand Research Station as in the preceding year.

Several officers were on leave during part of the year notably Dr. Burns (Economic Botanist and Principal, Agricultural College, Poona) when Rao Bahadur P. C. Patil acted as Principal and Mr. G. B. Patwardhan as Economic Botanist. Mr. E. J. Bruen (Livestock Expert to Government) proceeded on leave for eight months from April 1929 and Mr. Ali Mahomed Ulvi is acting for him. Rao Bahadur P. C. Patil (Professor of Agricultural Economics), Dr. G. S. Cheema (Horticulturist), Rao Bahadur D. L. Sahasrabuddhe (Agricultural Chemist), Mr. G. B. Patwardhan (Assistant Professor of Botany), Mr. C. S. Patel (Cotton Superintendent, Gujarat), Mr. C. G. Paranjape (Assistant to the Agricultural Engineer) and Mr. T. N. Jhaveri (Assistant Professor of Entomology) were also on leave for short periods and their acting vacancies were filled respectively by Mr. V. G. Gokhale, Mr. H. P. Paranjpye, Mr. N. V. Kanitkar, Mr. L. B. Kulkarni, Mr. G. B. Pathak, Mr. V. Y. Chitale and Mr. V. G. Deshpande. Rao Bahadur Bhimbhai M. Desai retired on the 31st December 1928 and he was succeeded as Deputy Director of Agriculture, Northern Division, by Mr. B. S. Patel who was succeeded in the professorship of Agriculture, at the College of Agriculture, by Mr. V. G. Gokhale, Deputy Director of Agriculture, Konkan. Mr. V. V. Gadgil has been appointed to act as Deputy Director of Agriculture, Konkan, *vice* Mr. Gokhale.

During the year under report the Department has lost, through retirement, Rao Bahadur Bhimbhai whose long official career was brought to a close on the 31st December 1928. Rao Bahadur Bhimbhai joined the Department in 1896 in the humble capacity of a clerk on Rs. 25 per mensem, but he was fortunate in coming under the notice of the late Mr. Mollison, a former Deputy Director, who was a wonderful judge of men and who had an unequalled capacity for training his assistants. This small group of "Mollison" men stood out sharply in the ranks of the Department, and they were distinguished for possessing a better grounding in the subject of practical agriculture than the majority of their colleagues. Rao Bahadur Bhimbhai, after passing through

the grades of farm Superintendent and Divisional Superintendent of Agriculture, rose to the grade of Deputy Director of Agriculture several years ago, and he rendered splendid service in the Surat area in popularizing and introducing improved cotton. He was perhaps the ablest agriculturist in the Department, if by that term is meant the man having the deepest insight into the practice and business of agriculture, and this accounted very largely for his success in the district where he always commanded the professional respect of the cultivators. On the eve of his retirement Rao Bahadur Bhimbhai was chiefly responsible under the guidance of the Commissioner, N. D., Mr. Smart, for the organization of the second Presidency Show held at Ahmedabad in November 1928, which, as described elsewhere in this report, was a great success. The recent conferment of a Rao Bahadurship on this officer was a fitting mark of appreciation by Government for the long and valuable services which he had rendered to Agriculture in Gujarat.

The following officers were on deputation during the year :—

Mr. W. J. Jenkins with the Government of India.

Mr. G. S. Kulkarni with the Indian Central Cotton Committee.

Mr. J. P. Trivedi, with the Bhavnagar State.

Mr. H. G. Baluch as Secretary, Cattle Committee, Sind.

Messrs. V. A. Tamhane and K. I. Thadani under the Lloyd Barrage Agricultural Development Scheme.

Their positions were filled in, respectively, by—

Mr. K. M. Pawar,

Dr. B. N. Uppal,

Mr. A. A. Vasavada,

Mr. Ali Mahomed Ulvi up to the middle of April till he was appointed as Live Stock Expert and then by Mr. M. M. Desai,

Mr. N. V. Kanitkar and

Mr. B. B. Desai.

Mr. Tamhane, Senior Residential Officer, continued to discharge the duties of the Officer-in-charge, Agricultural Research Station, Sakrand.

The proper organization of the Department in Sind to prepare the country for perennial irrigation still, however, remains to be carried out. A step forward was recently taken by

the Legislative Council, in August 1929, when it approved in principle of the Scheme of expansion for the Department. The appointment of Chief Agricultural Officer, however, has not yet been made. Better progress can be reported with regard to the post of Cotton-Research-Officer mentioned on page 28 of last year's annual report, whose duty it will be to preside over and direct the detailed research in the Cotton section of the Department. Government has accepted the offer of the Indian Central Cotton Committee to place a first class officer at the disposal of the Bombay Department of Agriculture for five years, and the Indian Central Cotton Committee are now taking steps to find a suitable man.

PUBLICATIONS

The Department has published during the year under report the following memoirs, bulletins and leaflets :—

Memoirs

Studies in the Jowars of Gujarat—

1. The jowars of the Surat District, by Messrs. M. L. Patel and G. B. Patel.

Bulletins

1. Bulletin No. 151 of 1928—Selection in the Jowars of the Bombay Karnatak, by Messrs. G. L. Kottur and V. M. Chavan.
2. Bulletin No. 152 of 1928—Water-finder work in the Bombay Presidency by Rao Bahadur D. L. Sahasrabuddhe.
3. Bulletin No. 153 of 1928—Economic value of fruit farming in Western India, by Dr. G. S. Cheema and Mr. P. G. Dani.
4. Bulletin No. 154 of 1928—Assimilation of nutrients by the rice plant, by Rao Bahadur D. L. Sahasrabuddhe.
5. Bulletin No. 155 of 1928—The Die-back disease of citrus trees and its relation to the soils of Western India, by Dr. G. S. Cheema and Mr. S. S. Bhat.
6. Bulletin No. 30 of 1908 (revised and enlarged, 1928)—Field, Garden and Orchard Crops of the Bombay Presidency, revised by Mr. G. B. Patwardhan.
7. Bulletin No. 157 of 1929—Study of the Soils associated with the deterioration of the cardamom crop in North Kanara, by Rao Bahadur D. L. Sahasrabuddhe.
8. Bulletin No. 158 of 1929—A preliminary note on the possibilities of the development of the lemon industry in Western India by Dr. G. S. Cheema and Mr. P. G. Dani.

9. Bulletin No. 159 of 1929—Agriculture in Sind under the Barrage Canals system by Mr. T. F. Main.

Leaflets (with vernacular versions)

1. Leaflet No. 4 of 1928—Home canning of fruits.
2. Leaflet No. 5 of 1928—Excellent rice variety (Kolamba No. 42) : What it is and where to get it.
3. Leaflet No. 6 of 1928—Control of the powdery mildew of grape.
4. Leaflet No. 7 of 1928—Control of the red rot of sugarcane.
5. Leaflet No. 8 of 1928—Rations for cattle when fodder is scarce.
6. Leaflet No. 9 of 1928—Hay, its making, and the use of the moving machine.
7. Leaflet No. 10 of 1928—The use of poudrette and town-sweepings as manures for dry crops of Jowar and Cotton in the transition tract of the Karnatak.
8. Leaflet No. 11 of 1928—Livestock Section extension service—the tick proof perch.
9. Leaflet No. 12 of 1928—Livestock and dairy section service—clean milk and how to produce it.
10. Leaflet No. 1 of 1929—Tobacco in Gujarat.
11. Leaflet No. 2 of 1929—Prickly-pear as fodder.
12. Leaflet No. 3 of 1929—Sugarcane-crushing.
13. Leaflet No. 4 of 1929—Hints on fig cultivation.
14. Leaflet No. 5 of 1929—Guinea grass.

T. F. MAIN,

Director of Agriculture,
Bombay Presidency, Poona.

Poona, 3rd September 1929.

APPENDIX A

LIST OF TALUKA DEVELOPMENT ASSOCIATIONS ORGANISED UP TO DATE

According to the scheme laid down in Government Resolution No. 3378, dated 5th June 1922, Revenue Department, 82 Taluka Development Associations have been formed until now as shown below :—

Gujarat Division

Surat District ..	..	..	3
Ahmedabad District ..	..	..	1
Kaira District ..	..	..	2

Khandesh and Nasik Division

East Khandesh District ..	..	..	10
West Khandesh District ..	..	..	7
Nasik District ..	..	..	5

South Central Division

Poona District ..	..	..	3
Sholapur District ..	..	..	3
Satara District ..	..	..	10

Southern Division

Belgaum District ..	..	..	4
Bijapur District ..	..	..	2
Dharwar District ..	..	..	6

Konkan Division

Kanara District ..	..	..	2
Ratnagiri District ..	..	..	4
Thana District ..	..	..	4
Kolaba District ..	..	..	1

Sind Division

Hyderabad District ..	..	..	4
Nawabshah District ..	..	..	1
Larkana District ..	..	..	2
Sukkur District ..	..	..	4
Thar and Parkar District ..	..	..	3
Karachi District ..	..	..	1

Out of the 82 associations 11 were formed in the year 1922-23 ; 27* in the year 1923-24 ; 10 in the year 1924-25 ; 11 in the year 1925-26 ; 15 in the year 1926-27 ; 8 in the year 1927-28 and one in the year 1928-29. Since 1928-29 no new associations are being formed and

*Out of 27 associations one was wound up in October 1927.

registered as Government instructed this Department not to encourage the formation of new associations and asked to restrict the expenditure strictly within the limits of the budget provision, as long as the Provincial revenues continue to be embarrassed. Subsidies amounting to Rs. 59,094 have been granted during the year 1928-29.

The Divisional Boards of Agriculture were asked during January 1928 to arrange the associations in order of merit as under :—

Class.—

- A. The most successful or efficient,
- B. Struggling Associations which deserve help if possible,
- C. Moribund Associations,

and according to this classification by the Divisional Boards the number of associations in each class is as under :—

32 in " A " Class.
 39 in " B " Class.
 11 in " C " Class.

—
 82

APPENDIX B

SUMMARY OF WORK DONE AT THE POONA AGRICULTURAL
COLLEGE FOR THE YEAR 1928-29*Notable Events of the year*

On October 1, 1928, H. H. the Maharaja of Kolhapur unveiled a bust of His Excellency Sir Leslie Wilson (then Governor of Bombay). This bust was presented by the Chief of Aundh and had been prepared by his artists. It now adorns the main hall of the College. The unveiling ceremony was a brilliant one, His Excellency the Governor and Lady Wilson, many princes, chiefs and important members of the public being present. The Hartog Committee (the committee appointed to report on education to the Simon Committee) visited the College in the same month. Earlier in the year, the terminal inspection by a committee of the Bombay University took place. This committee consisted of Father Blatter S. J. and Mr. R. G. Allan (Principal of the Agricultural College, Nagpur). The annual social gathering was held on December 14, 1928, when Mr. T. F. Main, O.B.E., B.Sc., Director of Agriculture, Bombay, delivered the address. Distinguished visitors who came to see the college during the year included Sir T. Vijayaraghavacharya (now President of the Central Committee of Agricultural Research); the Honourable Mr. Seturatnam (Minister of Development, Madras); the Honourable Mr. B. V. Jadhav (Minister of Agriculture, Bombay); the members of the Age of Consent Committee; Mr. H. H. Peterson (Secretary, National Council, Y.M.C.A., Calcutta); Miss Matheson (an Arbitrator of the Industrial Court and Trade Boards in Britain); Mr. Alexander MacKelvie (a Director of Scottish Mission Industries, Ltd.) and Mr. C. Z. Klötzel (Special Correspondent of the *Berliner Tageblatt*).

*Examination Results**Final examination for the degree of Bachelor of Agriculture
held in March 1929*

In all 79 men appeared for this examination and 60 passed, one in the first class, 39 in the second class and 20 in the pass class, a total pass percentage of 75.9 per cent. It is exceedingly difficult to get a first class in the final Examination and the last one was secured in 1925.

The following was the distribution of the final-year students according to optional subjects and the passes in each :—

Optional.	No. appeared.	No. passed.
Intensive Study of certain Crops—		
Cotton 8	15	5 6 1
Sugarcane 6		
Rice 1		
Advanced Plant Breeding 21		14
Advanced Agricultural Chemistry 7		6

Optional.	No. appeared.	No. passed.
Advanced Animal Husbandry and Dairying.	2	1
Advanced Agricultural Economics ..	11	7
Advanced Horticulture ..	18	15
Advanced Plant Pathology ..	5	5
Totals ..	79	60

Intermediate Examination

In all 78 appeared. Of these 3 passed in the first class, 42 passed in the second class, and 9 in the pass class, a total of 54, being a pass percentage of 69·2 per cent.

Compared with last year the results are as follows :—

Final Examination

1928	.. .. .	50·6	per cent.
1929	.. .. .	75·9	per cent.

Intermediate Examination

1928	.. .. .	73·7	per cent.
1929	.. .. .	69·2	per cent.

Four Students appeared for the final examination of the College diploma and all passed. 5 students appeared for the Intermediate examination for the diploma and 3 passed.

Of the 54 students who availed themselves of the opportunity of sitting for examination in botany and plant pathology at the end of their second year, 45 passed in two subjects, 9 passed in one and none failed in both.

Short (one year) Course.—Sixteen students took this course of whom 11 passed the test at the end of the year.

Admissions for 1929-30

The number of men who applied for admission, who were actually admitted, and who were present in the College on June 30 (*i.e.*, 20 days after the start of the new session) are as below :—

—		Applied.	Admitted.	Arrived.
<i>Area—</i>				
Bombay Presidency and its native states and Sind	Degree ..	119	92	66
	Diploma ..	5	2	2
	Short course ..	28	23	14
Other parts of India..	Degree ..	53	8	6
	Diploma ..	10	2	2
	Short course ..	5	1	2
Total ..		220	128	92

Two points deserve emphasis, the failure of a large number of admitted men to join the College and the large outside demand. The failure of admitted men to join is apparently an ineradicable defect. It occurs year after year and makes it impossible to judge, except by guess-work, what the final number in the first year class will be. It greatly complicates the task of the Principal in admitting men, as he cannot know till the last minute whether he has actually filled the available vacancies or not. A very small number of the men who fail to join give the Principal any notice of the fact, most of them simply stay without warning, forfeiting their Rs. 5 caution money, and some join for a few days, even occupying a room in the hostel, and then decamp.

Scholarships for 1929-30

There are fifteen scholarships of the value of Rs. 15 awarded annually. The following is the distribution of these by castes for 1929-30 :—

* Marathas	..	..	..	..	6
Brahmin	..	..	..	..	1
† Havik Brahmin	..	..	..	..	3
* Saraswat Brahmin	..	..	..	..	1
* Lingayat	..	..	..	..	3
Mahar	..	..	..	..	1
					—
					15

Optional Subjects

The following statement shows for the last 3 years the number of students electing each of the possible optional subject in which they may specialise in their final session :—

Subject.			1927-28.	1928-29.	1929-30.
Intensive study of certain crops	..	..	19	15	13
Advanced Plant Breeding	..	..	12	21	8
Advanced Agricultural Chemistry	..	..	5	7	8
Advanced Animal Husbandry and Dairying	..	..	3	2	8
Advanced Agricultural Economics	..	..	11	11	15
Advanced Horticulture	..	..	17	18	11
Advanced Plant Pathology	..	..	5	5	1
<i>Old rules</i>					
Advanced Botany	..	..	2	..	..
Stock Breeding, Feeding and Dairying	..	..	1	..	..
Totals			75	79	64

* Each includes one four-year scholar.

† Includes two four-year scholars.

It will be seen that there is considerable fluctuation in the relative popularity of subjects from year to year. There are many factors determining the students choice of an optional subject, and it is not possible at present accurately to forecast the future of any optional subject.

Careers of Graduates

It is exceedingly difficult to keep track of our graduates, as they either change their addresses and give no warning, or cannot be bothered to reply to enquirers. In the end of May 1929 the Principal sent a circular to the thirty graduates of the previous year, enquiring how they were employed. Only seven sent replies.

There is a growing tendency among graduates to attempt to get a foreign degree after taking the B.Ag. Such study abroad is expensive and students incline to embark on it without carefully estimating what their prospects and financial condition will be after it is over.

It is very satisfactory to note that sons or relatives of members of the landed aristocracy and large landowners now form a definite and growing group in the college.

In many departments of Government and of the business world there is now a distinct leaven of agricultural graduates. One B.Ag. who is a Science teacher recently took his Bachelorship of teaching, standing in the first class in both the practical and theoretical sides. One is a senior employee in a well-known foreign Trading Agency in Bombay. Imperial Chemical Industries (India), Ltd., now employs 11 of our graduates. The Research Schemes of the Indian Central Cotton Committee occupy a number of agricultural graduates. Researches financed by the Sassoon David Trust employ men. In the revenue service agricultural training is of the greatest use in the position of Mamlatdar, or deputy collector, for which posts agricultural graduates are occasionally selected. In the Irrigation Department they have proved of value in the work of the Research and Development Circle. Private farming on their own land is still a paying proposition only for those with a fair amount of land and capital ready to hand, but there is a distinct possibility of openings as managers of estates, sewage farms, and inam lands and it is hoped to exploit this. As headmaster of mission vocation schools our men have been a success.

Library

In the course of the year 212 volumes were added to the library. The total number of books in the library (apart from periodicals) is now 7,245.

Athletics and Social Activities

The U. T. C. platoon under Mr. K. S. Kulkarni had a successful year, and went under canvas as usual, during the Christmas holidays. The Rover Scouts continued to flourish under Mr. A. A. Vasavada, Scoutmaster. In the Inter-collegiate sports, the College carried off the one-mile flat race challenge cup.

The College Gymkhana was well managed and provided opportunities for recreation in all games.

Veterinary Hospital

The number of out-patients during the year was 4,702 and of in-patients 423.

Bai Sakarbai Nusservanji has given a generous donation of Rs. 30,000 for the reconstruction of this hospital, on condition of its being called the Nusservanji Hospital. It is hoped that the work will be put in hand this year.

Personnel

It is considered unnecessary in a report intended for the public to go into many details of leave and acting arrangements. The Principal, Dr. W. Burns, was on leave for 3 months and 20 days, when Rao Bahadur P. C. Patil, acted and Prof. J. P. Trivedi was on deputation with the Bhavnagar State during the whole year when Mr. A. A. Vasavada acted as Professor of Agricultural Engineering, Physics and Mathematics.

W. BURNS,
Principal,

College of Agriculture,
Poona, July 3, 1929.

College of Agriculture, Poona.

APPENDIX C

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, NORTH CENTRAL DIVISION, NASIK,
FOR THE YEAR 1928-29*Staff and Organisation*

I was in charge of the Division throughout the year under report. I was deputed to Berars to study the working of the cotton markets, working under Market Act for a fortnight. Mr. G. P. Jambhekar, B.Ag., was transferred to Konkan Division, and Mr. S. S. Surve, B.Ag., took up his work as District Agricultural Overseer, Erandol. Mr. J. N. Purandare, B.Ag., is put on Bunding work and his post of Head Master, Agricultural School, Dhulia, was filled by Mr. S. K. Ghorpade.

During the year under report, the post of a clerk for Cotton Supervisor's Office was sanctioned, and in that arrangement some transfers in the subordinate staff were made. In order to facilitate the work of eradicating the Small Japan (red seeded) variety of groundnut, the headquarters of the Agricultural Overseer, Jamner, were transferred to Chalisgaon. In spite of the efforts of the Propaganda staff to cope with the work, it is found that there is a great necessity of at least one Graduate to deal with crop pests, as well as of one officer for work on Girna Canal.

The experimental work on Jalgaon Farm is increasing every year and the staff for the purpose is inadequate. The farm was originally started as seed farm, and the staff was sanctioned as per its requirements, strength being, Farm Superintendent, one Non-Graduate Fieldman, a Store-keeper and one Mukadam. The Non-Graduate Fieldman has to attend to accounts and other office work, and gets no time to look to the farm work. The Farm Superintendent gets practically no help from the Non-Graduate Fieldman. He could manage the work as long as the farm was worked as Seed Farm, but since the splitting of Central Division, this being the only farm in the North-Central Division, experiments with Cotton and Wheat were arranged. During recent years, this work has much increased, and in order to get proper observation notes and records, it is necessary to have one more Graduate on the Farm. The experimental work on the farm consists of—

- (1) Trial of cotton strains,
- (2) Manuring of cotton,
- (3) Trial of seed-drills and cotton planters,
- (4) Trial of wheat strains,
- (5) Manuring of wheat (dry),
- (6) Comparing cultural methods,
- (7) Manuring of groundnut.

The Annual Staff Conference was held at Nasik, when all the members, except the Mechanical Assistant, were present. All data on plot experiments and field trials were thoroughly discussed and the programme for the year 1929-30 was drawn on the results obtained during past years,

after discussion. During the discussion, it was pointed out that there is a great necessity of having one Graduate to deal with the problems of insect attack.

Season

The season was very peculiar this year. The start was very irregular, some places like Dhulia getting early start, while in East Khandesh, the start was late by about ten days. The rain in few places was above-normal, and in the rest, it was nearly normal but the distribution was uneven. The early showers were severe which affected germination of cotton.

Special features of the season were :—

(1) Rainfall started in the middle of June, with great intensity at Dhulia, but was scanty in most talukas of East Khandesh, and Kharif sowings were not complete till the middle of July. Such defective-rainfall is unusual in East Khandesh, and large area under cotton had to be resown.

(2) The long break in August checked the growth of Kharif crops to a great extent, and in particular, groundnut, which was in flowering stage.

(3) Rainfall in October caused shedding of bolls of cotton and delayed harvesting of groundnut.

(4) Rains in September and October proved useful for Rabi-crop but damaged the Kharif crops to a certain extent.

(5) Hail storm, accompanied by heavy rains, varying from 2½" to 5½" in December, damaged the crops in most of the talukas. The crops badly affected were cotton, fruit crops, vegetables, chillies, etc. Loss of human life as well as of cattle and sheep was reported.

(6) The distribution of kharif rains, though tolerably well to kharif crops, was not good for the growth of grass, the growth being poor from start to finish.

(7) Last came the cold wave on January 31st and 1st of February which affected seriously sugarcane, plantain, chillies, brinjals, castor, cotton, grapes, guavas and certain other crops like irrigated wheat, Methi, gram, etc.

(8) In general, the kharif crop yield was from 6 to 8 annas, while that of Rabi Jowar, wheat, and sugarcane, was poor. Grapes were completely damaged.

Diseases.—Pests of any serious nature were not reported from any part, except that on betel vines, chillies and onions.

Reports of trouble from rats to rabi crops, as well as to sugarcane, were received from Khandesh and Nasik Districts.

The wilt in cotton tract was rather serious this year. The havoc played by wingless grasshoppers in Nasik District continued. In Chandor Taluka, practically no Bajri crop was taken in affected villages.

Research and Experimental Work

Cotton Crop Improvement.—The work of finding out a strain of better staple and ginning as well as the study work as reported in last year's report, was continued.

With a view to obtain significant yield data, of Dhulia 1 critical yield tests were made on the same lines as those of the previous years. From the results obtained it has been observed that—

“The strip trials gave a superiority of N. R. over Dhulia 1 of 2 lbs. per guntha. In the field scale trials of 5 gunthas, Dhulia 1 has for the second time been a higher yielder than N. R. The ginning percentage of Dhulia 1 has, for the last three seasons, been consistently higher than N. R. by about 3 per cent. In staple quality it has decidedly been superior to N. R. and fetched this year a premium of Rs. 18 to 20 over that of N. R. per candy of 784 lbs. lint. It has spun 18's (counts) this year as against 10's (counts) of N. R.”

During the year another strain, BXXI, was given a trial, in comparison with Dhulia 1 and N. R. It is seen that it is a low yielder but the staple is better than both. Further trials have been arranged.

Attempts to isolate a desirable type in N. R. have given preliminary indications of one promising strain, namely, N. R. 6. This will be tested in field conditions during the coming season.

Hybridisation.—The hybrid study between Dharwar 1 X U 29 and Dhulia 2 X Comilla, has, in F₂ generation, revealed the fact that the former cross seems unsuited for Khandesh conditions whereas the latter has given rise to a number of plants with all desirable characters, the study of which will be continued.

To obtain a cotton of good staple and highly resistant to wilt pest, attempts have been made during the year to cross Dhulia 1 with Dhulia 2 and BXXI.

Farm Experimental Station Work

Jalgaon Farm, East Khandesh.—As reported in the last year's report, the experimental work on this farm is increasing every year, as there is no other farm in this Division to take up the experimental work.

The following average crop yields per acre were obtained on the farm during the year under report:—

Cotton—127 acres and 3½ gunthas	..	N. R. 432 lbs. Dhulia 428 lbs.
Groundnut—24 acres and 2 gunthas	..	1445lbs.
Jowar and Udid—22 acres and 20½ gunthas	..	Jowar 1151 lbs. Udid 197 lbs.
Wheat—16 acres and 5½ gunthas	..	1012lbs.
Gram—1 acre	..	77lbs.
Coriander—2 acres and 18 gunthas	..	Crop failed.

The uneven distribution of rain, the long break in August, heavy rains and hail storm in November and December, and again cold wave in

January and February had a very bad effect on the general yield of crops. The cotton yield obtained was from two pickings only, since all the bolls and leaves were destroyed by the hailstorm in December and there was no third picking. In spite of all these calamities, the yield obtained is not bad, when compared with district yields. The cotton crop suffered a good deal in the beginning, due to scarcity of rain, and about 50 acres had to be resown. With the peculiar season, the yield obtained is good. Jowar crop, in the beginning, was not vigorous for want of sufficient moisture, but later on improved and gave a good yield; but the grain and fodder were spoiled by late rains.

Two varieties of Jowar are being grown on the Jalgaon Farm, namely, Alaspuri and Godgarya. The yield of Godgarya in grain is always more than that of other, but the fodder is inferior. Godgarya has a tendency to lodge.

The yield of 1,012 lbs. of wheat shows what a soil, if properly handled, can give. This is a very good yield and is much more than the average of the district.

Gram and coriander crops were damaged by the hailstorm and have completely failed.

The work on Cotton Manuring was continued this year on the lines stated in the last year's report. These experiments were started with a view to find out if the deficiency of Farm Yard Manure can be filled in by using cakes and other artificial fertilizers like Sulphate of ammonia and Nitrate of Soda.

Castor cake in 300 and 400 lbs. doses was found to be beneficial and was recommended. But the cost of castor cake increased with the increase in demand. The groundnut cake mixtures were tried for three years and in these three years' trial it is found that the mixtures give an equal yield with the 400-lbs. dose of castor cake. The cost of the mixture is nearly Rs. 15 per acre. The mixtures tried per acre are 200 lbs. of groundnut cake *plus* 40 lbs. of Sulphate of ammonia, 200 lbs. of groundnut cake *plus* 50 lbs. of Nitrate of Soda.

As the results are continuously in favour of these mixtures no more trials are necessary and can safely be recommended to the cultivators.

The second series started last year, namely, 8 cartloads of farm yard manure *plus* half the dose groundnut cake mixtures, or 40 lbs. of sulphate of ammonia, have given results which are encouraging, but need further trials.

Groundnut Husks treated in Cattle Byre

This is the 2nd year of the trials. It was given equal in quantity of farm yard manure, namely 15 cartloads per acre, and the results are encouraging, as well as corroborate those of the last year. Further trial has been arranged.

The groundnut mixtures were given a further trial in the District and have given good results. The cost of these mixtures does not exceed Rs. 15 and everywhere these mixtures have proved economic and useful.

In places where the cost of Farm yard manure exceeds Rs. 1-8-0 per cart, these mixtures will prove useful and still better will be in half doses with eight cart loads of Farm yard manure. These mixtures are to be given at the time of sowing and should be drilled in the soil.

Wheat.—Only two strains, namely, Nos. 224 and 162, were tried this year. This is the fifth year of the trial and strain No. 224 is found to be a fairly good yielder, as compared with the local Bansi wheat under Jalgaon conditions. All these strains have received sufficient trial for over three years and the results obtained show conclusively that only strain No. 224 stands to comparison and is a better strain which can be recommended for trial round about Jalgaon. The grain is superior to local Bansi and fetches better price.

The trial of four strains of Pusa wheat, namely, 4, 12, 52 and 80-5, was continued this year. All these strains were grown as dry crops in comparison with local Bansi and found to be low yielders, the difference being over 200 lbs. per acre. From the results obtained during past year it can be said that these strains give low yield as a dry crop and are not suitable for Khandesh conditions.

Wheat rolling experiments.—This is the fifth year of these experiments. From the results obtained during the year and of previous years, it is seen that rolling in the 3rd week, gives better results. As the results are conclusive, these experiments will be discontinued.

The work of manuring of dry wheat was started this year and will be continued. The manures tried have not paid their cost, but nothing can be said, as this is the first year of the trial.

Besides these crop trials, Agricultural Engineer's seed-drill was tried on the Farm and modifications were suggested to suit the local conditions.

Nursery.—As reported in the last year's report, this work has been divided in two centres, namely, Khed and Dhulia, and the same was continued this year. During this year one more centre has been added on the farm of Mr. Randive. During the year under report, 140 plants have been sold and 140 are ready for sale. 2500 Jamburi plants are ready for budding and the percentage of success in budding during the year was 58 to 61, owing to after effect of frost. The Horticultural Overseer in addition, had budded 75 orange, 16 lemon and 195 bor plants and grafted 112 mango plants in the District, with success. He has attended to pruning of plants in several places. He teaches the budding and grafting work to the students of Dhulia School.

Belgaon plot.—The work of trials of Kusali Bajri, different Nagali strains from Hatkamba Farm, was continued.

Bajri.—The Kusali (Awne) Bajri has continuously given better yield, on this plot, than the Akola. This is a transition tract where rainfall is a bit more than Desh Tract.

Nagali.—Strain No. E-31 was tried but did not show any superiority over the local seed.

Wheat.—The ~~long~~ Pusa strains were tried on this plot and the results show that Pusa 4 is superior to other strains.

Manuring of onions.—From the result it is seen that a dose of 200 lbs. of Nitrate of Soda is superior to others and is economic. The results obtained during the last year about Suran and growing onions for seed 18" apart are corroborated this year.

Sangvi cattle breeding farm.—As reported in the last year's report, this farm was taken over from the Shirpur Association. Since the transfer many improvements in the management of cattle have been made. The cattle are much tamed and are in better condition.

There is a plot attached to this farm, the development of which to grow fodder, has been taken up. 5,000 bundles of kadbi and kulthi were grown on this farm. The fodder for the farm was purchased from forest and a silo was filled in with success. There are 75 animals on the farm, of which 25 are male calves of different ages. During the year under report, the farm has sold 6 breeding bulls. The total amount realised from the sale of cattle was Rs. 1,214 which was credited into the treasury. During the year 3 male calves and 2 cows were killed by panther which is a serious trouble when the cattle are sent for grazing in the coup. No quarters have yet been provided, which is a great handicap.

District Work

This is a very concise report of the work done in the district, since detailed information cannot be embodied owing to limited space assigned for the purpose. The work consists of—

(1) Verification of the results under different conditions.

(2) Trial of manures.

(3) Popularising the recommendations of the Department, such as Akola bajri, Pusa wheat, use of cake and cake mixtures for cotton and sugarcane, use of sulphate of ammonia and nitrate of soda for rice and onion respectively.

(4) Trial of wheat strains.

(5) Distribution of seed of improved types as well as implements.

(6) Attend to special inquiries on crops.

To carry out this work help of Taluka Development Associations is taken, where available, and of individuals as well as of officers of other Departments, where these bodies do not exist.

The trial and experimental work done during the year is given below, crop by crop :—

Cotton.—The manurial trials to confirm the results of previous years were continued. The same manures as described in paragraph 30 on page 42 of the Annual report of the Department for the year 1927-28, were tried. The results obtained are in favour of the groundnut cake mixtures and the trial is sufficient to recommend the manures as suitable to cotton crop.

(2) Trial of Dhulia I was arranged in certain tracts as well as on Girna Canal. The results obtained show that D I is in no way inferior to N. R. in districts where it was tried. The results of trial on Girna Canal show that the yield of D I is less than N. R. by about 70 lbs. per acre. But the ginning percentage in D I was higher than N. R. by about 4 per cent. The trials will be continued.

Bajri.—The trials of Akola Bajri showed the superiority of Akola Bajri and there is an increasing demand for the seed of Akola Bajri. Trials with different manures have been arranged. These trials are continued.

Jowar : (1) *Varietal trials*.—The trials show that Dagadi and Maldandi jowars (Rabi) are promising for Shahada Section and the work will be continued.

(2) As a preventive against smut sulphur treatment was given to Jowar seed, as compared with copper sulphate solution treatment. Sulphur treatment is easier and cheaper and gives equally good results.

(3) Manuring of jowar crop has been taken up and needs further trials.

Wheat : (1) *Varietal trials*.—The Pusa wheats as dry crop are low yielders and some of them shed their grain. Crop Botanist's strains Nos. 162 and 168 seem to be suitable for Trans-tapti talukas and 103 for Nasik District.

(2) The work of manuring dry and irrigated wheat was started this year and the trials will be continued.

(3) Planking of wheat three weeks after sowing has again given good results this year. From the results of the last three years, it can be said that this operation can now be recommended.

Sugarcane.—J. 133 has given good results and the area under this variety is increasing. H. M. 544 shows prospects on Girna Canal. The trial of dry cultivation of sugarcane in Igatpuri taluka of Nasik district was continued and the conclusions drawn in the last year's report, namely, "whiteants damage the crop to a great extent and make the cultivation not paying" have been corroborated. These trials will be discontinued, as the results are conclusive.

Rice.—The work reported in the last year's report was continued. The results show that Kolumba No. 42 deteriorates in 2 years and to get best results fresh seed should be brought every year. Kolumba No. 79 shows good prospect of its being useful.

In order to draw any conclusions about manuring of rice further trials are necessary.

The trials of reduced seed-rate to 45 lbs. per acre in Sakri Taluka have given better yield. This has corroborated the results of the last two years.

Chillies.—The work of manuring of chillies was continued; but to draw any definite conclusions further trials are necessary.

Onion and garlic.—The manures tried were Sulphate of ammonia, Nitrate of soda and Calcium cyanamide. In these trials, Nitrate of Soda stands first.

Miscellaneous

Power chaffcuttter.—There are two power chaffcutters—one worked by Campbell and the other by Peter engine. Campbell engine did not work properly during the season and is under repairs. The other was taken in district and the working was demonstrated in 6 villages of Jalgaon, Erandol and Parola talukas. The working of the machine was also demonstrated in Jalgaon district Show. The work was much appreciated and a demand has been created for such a machine. During the year this machine was worked for 80 days and has cut 28,425 bundles weighing 81 tons nearly. A nominal hire charge was kept and the hire realised was Rs. 35-8-9, the owner supplying fuel, labour, etc.

During the working season it has been observed that change in labour affects the output.

The work in backward tract of Bhils was organised and a special kamgar worked in the area. He demonstrated the use of copper sulphate as a remedy against Jowar Smut and arranged to distribute 490 packets. Iron plough was successfully demonstrated, as well as arranged to sow Broach cotton at a wider distance. People were induced to sink or use their wells and crops of brinjals, chillies and sugarcane were successfully grown on small scale. The work done so far has impressed the people and now they are coming to the Kamgar for seed, implements, etc.

Taluka Development Associations

All the 22 Associations in this Division are doing good work. Two talukas, namely, Jamner and Parola, have collected funds and have sent in their applications for registration, but these are not sent for registration as per recent orders of the Government. All the propaganda work in these talukas is done by these associations under the guidance of the Departmental officers and the work done so far is satisfactory.

Great enthusiasm has been shown by the Associations at Jalgaon, Pachora, Amalner and Bhusawal, in distributing and concentrating the work under Dhulia I. Without their help the concentration work would have been difficult.

During the year under report, the East Khandesh District Local Board has contributed Rs. 300 for all the 10 Associations and the Nasik District Local Board has contributed Rs. 200 to each.

Non-credit Work

During the year under report a Sale Society was organised under the auspices of Jalgaon Taluka Development Association and all possible

help was given to organise its work. During the year under report the Society has collected a share capital of Rs. 2,000. It has made a business of Rs. 1,25,000 and earned a profit of Rs. 700.

The Manure and Implement Society at Dabhadi has made some progress and is doing useful work.

The Onion Sale Society at Niphad has done a good progress during the year. During the year the Society handled 4,400 bags as against 2,400 of the last year. The gross income is nearly Rs. 700 and the expenditure is nearly Rs. 500. It is expected that nearly $\frac{3}{4}$ of the loss of the 1st year will be made up this year. This progress is due to the exertions of Mr. Balvantrao Vagh, the Chairman of the Society.

Nayagaon Seed Society has done a fairly good business in seed worth Rs. 1,500.

Demonstration Work

During the year two District Shows—one at Jalgaon and the other at Nasik, were organised. The Show at Jalgaon was opened by the Collector, East Khandesh, but that at Nasik had to be postponed on account of Plague at Nasik. The Show at Jalgaon was attended by over 15,000 people. The Crop Court attracted much attention. About 1,582 exhibits of farm produce and 209 of cattle were exhibited. There were some good specimen of cattle. Forest, Co-operative and Veterinary Departments had arranged their stalls. In all, 114 prizes were distributed. At Nasik, in order to take advantage of the arrangements made, a demonstration was arranged, which was attended by cultivators from five talukas. The most attracting features were—Bundling of fields, silo and some of the crops.

Besides these two big shows, following demonstrations were organised :—

Serial No.	Kind of Demonstration.	Number	Attendance.
1	Crop demonstrations	46	Over 3,000
2	Implement demonstrations	54	2,000
3	Power chaffcutting demonstrations	7	300
4	Silo demonstrations	3	600
5	Boiling of cane juice on Poona furnace	6	400
6	Steeping of jowar in copper sulphate solution.	250	4,000

Besides these, 21 Jamabandi demonstrations were arranged which were presided over by Prant Officers and Collectors. In addition, help was given to all Taluka Development Associations to organise crop and implement demonstrations in their sections.

As a result, demand has been created for the seeds of Dhulia I cotton, Akola Bajri, Pusa wheat, J-133 variety of cane, Sulphate of ammonia, Nitrate of soda and iron ploughs and mhots. A liking has been created to fill in grass silos and during the year 4 silos were filled by cultivators and Associations.

WORK DONE IN DISTRIBUTION OF SEED, MANURES AND IMPLEMENTS

Distribution of Seed

Cotton.—In cotton the work consists of extension of area under pure N.R., Dhulia I and 1027 ALF. The process of distribution is fully described in the Annual Report for 1923-24.

During the year 1928-29, 14,086 lbs. of Jalgaon Farm N.R. seed was distributed amongst 16 Taluka Development Associations, 2 Co-operative societies and two individual seed-growers. The area grown under this seed was purified and the produce ginned under the supervision of the officers of the Department and of Associations. Out of the quantity of seed produced, half the quantity, namely, 72,103 lbs. was purchased by the Department and Associations, and the remaining quantity was with the growers, as per conditions. This quantity of seed will be distributed in concentrated area, while the seed with the growers will be used by them or will be sold to their neighbours or relatives. The aim is to concentrate the area in order to wipe off the local cotton and thus avoid mixture. The total quantity distributed during the year was—

Purified seed purchased by the Associations and	
Department	72,103 lbs.
Seed distributed from the growers' stock by them ..	72,103 lbs.
Seed purchased from reputed cultivators and	
supplied to people outside the Division ..	50,000 lbs.
	194,206 lbs.

5,000 lbs. of Dhulia I seed from Jalgaon Farm was supplied to Jalgaon Association. The purified seed of 2nd and 3rd generations was supplied to five Associations—which was grown on an area of 2,872 acres. All this cotton was purified and ginned under the supervision of departmental officers and the seed has been purchased by the Department, the quantity being 197,270 lbs. This seed has again been issued to five Taluka Development Associations for distribution amongst their members in concentrated area. There is an equal quantity of seed with growers, who, after keeping sufficient seed for themselves, have sold it, some of which has gone to Raver and Shirpur talukas. The area anticipated during the year 1929-1930 is 25,000 acres.

The variety is getting popular both with the growers and merchants, as will be seen from the increase in area as well as from the increase in demand of seed.

Year.		Area.
1926-27	.. ..	50 acres
1927-28	.. ..	800 acres
1928-29	.. ..	3,000 acres
1929-30	.. ..	25,000 acres

The increase is due to—

- (1) D.I. is in no way inferior to N.R. in yield ;
- (2) D.I. gives 3 per cent. more ginning than N.R. and nearly 5.6 per cent. more than local cotton.

(3) D.I. gives 15 to 20 rupees more per Candy, or Rs. 3-8-0 per maund of 168 lbs. of ginned cotton, if the produce is pure.

For impure cotton 5 rupees less per *boja* are given. The extension of 1027 ALF is slowly taken up in Nawapur taluka and the seed supplied was 2,000 lbs. Systematic arrangements are being made to organise the seed supply as well as to keep the produce pure.

Extension of Akola Bajri and Pusa Wheat.—The cultivators in all the three districts have acknowledged the superiority of Akola Bajri and Pusa 4 wheat and there was a large demand for the seed. Seed worth Rs. 1,100 of Akola Bajri was supplied to Associations as well as individual cultivators. There is a large demand for this seed and it seems necessary to have some organisation in the villages from which the seed comes. These are villages on the borders of Nasik and Ahmednagar districts, and efforts will be made to have some organisation for the supply of good seed.

Pusa wheat, especially No. 4, has a large demand in irrigated tract and seed worth Rs. 400 was supplied to several cultivators.

Implement depôts.—Only 10 depôts are maintained, while the rest have been transferred to the Associations. These depôts are in non-association talukas. The hire realised during the year was Rs. 999-5-3. These depôts serve as centres for supply of improved seed and implements, manures as well as serve the supply of information.

Crop protection.—There is a serious trouble of wingless grasshoppers in four talukas of Nasik district. Arrangements to demonstrate the remedy to destroy the pest were made.

To demonstrate the utility of suggested remedy, an area of one village was taken and the tinning operations were demonstrated. The area worked was 500 acres and the cost of working the area came to Rs. 491. As a result of the demonstrations, people from several affected village asked for tins and tar, and 80 tins and tar worth Rs. 616 were supplied by the District Local Board, and Rs. 239 from Government grant of Rs. 1,200. The villagers worked the tins on an area of nearly 1,000 acres. The people have been convinced that the remedy is effective and it is expected that many villagers will make use of the tins in the next year.

The pig trouble in Nasik and Khandesh districts continued and arsenic was tried but the results are not encouraging.

Poisoning of rats with arsenic was successfully carried for wheat crop.

Tractor working.—This year the tractor was worked in Dhulia and Sakri talukas of the West Khandesh districts, the area ploughed was 191 acres and 35 guntas, and the amount spent was Rs. 2,736-6-0.

The amount realised as hire during the year was Rs. 1,036-2-6 which was credited into the treasury. The area ploughed was small when compared with that of last year, due to the illness of the driver and breakage of hind wheel which was not available. In order to get good output it is advisable to have two men on the tractor for work. The work has

been much appreciated and there is demand for ploughing with the tractor, especially in weed-infected fields.

The success of propaganda as well as popularity can very well be judged from the results achieved during the year, since large demand has been created for improved seeds and implements, as well as cultural methods and people have begun to take up our advice freely. Few items can be enumerated in support of this statement :—

(1) There is a great demand for N.R., D.I., and Akola Bajri seed, which shows that they have become popular.

(2) Area under Spanish peanut is increasing in Nasik district.

(3) Large quantities of Sulphate of ammonia and Nitrate of Soda are being used.

(4) People in Nasik district have taken up tinning operations to destroy wingless grasshoppers.

(5) Use of sulphur on a large scale as a remedy against mildew on grapes.

Work in Dangs.—The work continued on the same lines under the supervision of the Dewan of the Dangs. During the year, 78 embankments have been erected and farm yard manure was stored by 28 persons in pits. The silo at Ahwa was successfully demonstrated and the growing of vegetables was shown with success. The Dewan reports that “The services of Kamgar are utilised for the betterment of Dangi cultivation and he is useful in every way for this purpose”.

A sugarcane class was organised under the auspices of the Taluka Development Association, Sakri at Malpur. 15 students attended the class, of which 10 have passed the test examination.

Work done by Mechanical Assistant.—During the year under report, he attended to the inspection work of the machinery of boring plants and engines and the machinery on the farm.

The work of overhauling of the chaffcutting plants was taken up and completed. After completing, he was given the charge of working the same in district. To run the plant kamgars are trained who work the engine and chaffcutter under the guidance of the Mechanical Assistant.

Site survey and preparation of plans and estimates were attended to, as usual. He prepared a site plan for the District Show, Nasik, which was postponed, on account of Plague.

Boring Work.—Mr. G. S. Moghe, B.Ag., Superintendent, Jalgaon Farm, supervised the work of Boring Section, in addition to his own duties, while the work of keeping store and accounts, etc., was done by Mr. K. V. Agashe. The post of Boring Assistant is still vacant. The staff given is found inadequate, there being no spare man who could work as relieving hand when any of the mechanics is either on leave or falls sick. One more man of the grade of fitter mechanic, who could regularly inspect the machines and get the work done properly from the mechanics by staying with them for some days, is necessary. Besides

this, the grant under purchase of tools is found to be inadequate. More spare parts are necessary to keep the machines always working. For want of spare parts the machines lie idle, and at times we have to wait for many days.

In spite of the difficulties, the output is good. Out of the three machines, one machine No. 11, was under repairs which could not be worked for nearly ten months. Some of the parts were not available and had to be ordered from England which took a very long time. This machine is set right and is working in Nasik district. The other two machines are working in East Khandesh. The total footage bored this year was 761 and this is the output of practically two machines. This footage for two machines is satisfactory, when the actual working days are taken into consideration. The idle days cannot be avoided being due to some mechanical trouble, breakages of part which could not be repaired by local firms, and accidents. In all fifteen bores were undertaken out of which four were successful, five left by the owners and three left by the Department. The output can be improved, if the difficulties pointed out above are removed.

The statement of particulars of bores made in the North Central Division from 1st July 1928 to 30th June 1929, together with cost of bores, etc., is enclosed in Appendix A.

Education.—During the year under report, Mr. J. N. Purandare, B.Ag., was transferred and Mr. S. K. Ghorpade, B.Ag., took his place, as Head Master. Excepting this, there was no other change in the working of the Dhulia Agricultural School. The total number of students undergoing the course was 31, 15 being in the 2nd year, and 16 in the 1st year. The accommodation at the School is for 30 students. Taken up by districts, the number of students was—

East Khandesh	..	..	..	13
West Khandesh	..	..	..	7
Nasik	..	..	..	11
				—
				31
And by caste, Mahrattas	..	..	..	14
Brahmins	..	..	..	2
Other backward classes	..	..	..	15
				—
				31

The training of carpentry, smithy, as well as in oil-engine work is being given in the school premises, and thus the time which was spent in going and coming to Technical school, is saved. Arrangements are being made to have weaving class on the Farm.

The poultry section is working satisfactorily, and regular instructions are given on the rearing of poultry to the students. It is going to be a distributing centre of improved poultry. The sale of birds and eggs amounted to Rs. 59 while the number of birds sold was 14 males and

females. The cost of education, during the year 1928-29, is shown below :—

	Amount.
	Rs.
Teaching establishment	3,873
Capital expenditure (purchase of dead stock, live-stock, etc.)	226
Recurring charges—cultivation, upkeep of livestock and machinery, etc.	3,885
Maintenance of students	3,560
	11,544

The amount collected by the Local Committee, during this year, for the boarding expenses of students was Rs. 3,838, the details of which are given below :—

	Rs.
District Local Board, Nasik	500
District Local Board, West Khandesh	500
Dhulia Municipality	200
Sir Sassoon David Trust Fund	500
Taluka Development Association, Dhulia	100
Taluka Development Association, Taloda	25
Taluka Development Association, Kadwa Canals	10
Previous balance	1,961
Interest	42
	3,838

The receipts credited into the treasury on account of sale of farm produce and poultry amounted to Rs. 1,593-4-3.

The annual examination was conducted by Mr. R. Y. Hulkoti, B.Ag., Inspector of Agricultural Schools, and Mr. N. V. Bhagwat, B.Ag., Cotton Supervisor. Thirteen students have passed the final examination, and 13 that of the 1st year.

There are 13 Agricultural Bias classes in the Division and necessary help in laying down cropping scheme and arrangement of plots, as well as on field instructions is given by District staff.

The remarks made in the last year's report hold good and no proper arrangements have yet been made to rectify the same.

The staff, with few exceptions, have done satisfactory work. Mr. N. V. Bhagwat, B.Ag., has done good work in the organisation of sale of D.I. cotton. The sympathy and co-operation shown by officers of other departments continued and is acknowledged with thanks.

K. M. PAWAR,

Nasik, 29th July 1929. Deputy Director of Agriculture, N. C. D.

APPENDIX

Annual Report of the Boring Work

Serial No	Name of well-owner.	Name of Taluka.	Name of village.	Diameter of Bore.	Depth Bored.	Water before boring in gallons per hour.	Water after boring in gallons per house.
1	Maratha Boarding	Jalgaon ..	Jalgaon ..	3"	29'-6"	Nil ..	....
2	District Agricul- tural Show.	Do. ..	Do. ..	3"	14'-0"	Surface ..	....
3	Mr. S. P. Kulkarni	Do. ..	Asoda ..	3"	36'-0"	Nil ..	....
4	Do. ..	Do. ..	Do. ..	3"	43'-0"	Nil ..	....
5	Mr. G. K. Patil ..	Do. ..	Shiroli ..	3"	50'-0"	....	....
6	Mr. B. N. Patil ..	Do. ..	Mahaswad	3"	40'-0"	Nil ..	200 gallons per hour.
7	Mr. N. R. Patil ..	Do. ..	....	3"	63'-0"	....	....
8	Mr. Sakharan Khandu.	Raver	Nend ..	3"	24'-0"	....	....
9	Mr. R. M. Kulkarni	Do. ..	Kohur ..	3"	38'-0"	1 mote work- ing for 2 hours.	1 mote working for 8 hours.
10	Do. ..	Do. ..	Do. ..	3"	39'-0"	Do. ..	Do. ..
11	Mr. M. V. Kul- karni.	Do. ..	Do. ..	3"	106'-0"	Do. ..	Do. ..
12	Mr. Shankar Vishnu Mahajan	Do. ..	Do. ..	3"	29'-6"	Do. ..	Do. ..
13	Mr. Ghansham Sandoo Chau- dhari.	Do. ..	Sawada ..	3"	....	....	....
14	Mr. Gowardhan- das Parshot'am.	Nasik ..	Nasik ..	3"	54'-0"	....	.. .
15	Do. ..	Do. ..	Do. ..	3"	6'-0"	....	

I

in the North Central Division, for the year 1928-29

Departmental charge.	Labour charge.	Total Cost.	Cost per foot.	Results.	Remarks.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
....	....	....	....	Incomplete	.. Left by Department. Labour charge not informed by owner.
....	....	....	....	Incomplete..	
....	....	....	....	Incomplete	.. Demonstration Work.
185 0 0	....	....	....	Incomplete	.. Labour Charge not informed by the owner.
54 8 0	....	....	....	Do.	.. Do.
46 0 0	108 3 3	154 3 3	3 14 3	Successful.	
....	....	....	....	In progress.	
52 8 0	....	....	....	Incomplete	.. Labour charge not informed by the owner.
....	....	....	....	Successful.	
82 4 0	175 0 0	262 4 0	3 6 5	Successful.	
549 12 0	120 0 0	269 12 0	2 3 11	Do.	
31 12 0	75 0 0	106 12 0	3 9 4	Do.	
....	....	....	....	In progress.	
62 0 0	....	....	....	Incomplete	.. Labour charges not given by the owner.
....	....	....	....	In progress.	

. APPENDIX D

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR
OF AGRICULTURE, SOUTH CENTRAL DIVISION, POONA,
FOR THE YEAR 1928-29

Staff

I remained in charge of the Division throughout the whole year.

The changes in the staff were as under :—

Mr. V. V. Gadgil, Acting Divisional Superintendent of Agriculture, Deccan Canals, Baramati, was transferred to Konkan as Deputy Director of Agriculture from October 1928 and his place was taken by Mr. G. P. Patil, District Agricultural Overseer, Satara. Mr. T. V. Nagarsheth from Gujarath was transferred to this Division and was posted as District Agricultural Overseer, Satara.

Mr. B. N. Bhandarkar, District Agricultural Overseer, Baramati, and Mr. S. B. Jadhav, District Agricultural Overseer, Malsiras, were on leave for four and seven months respectively and in their vacancies Mr. V. G. Dharwarkar worked throughout the period.

Mr. T. S. Swadi, Superintendent, Manjri Farm, was on one month's leave from the middle of May and during his absence Mr. R. D. Khandekar held charge of the Farm.

Mr. N. B. Patwardhan, Graduate Assistant on the Manjri Farm, was deputed to Coimbatore to study for a period of three months the various morphological characters that are used at the Sugarcane Station there, for distinguishing one variety from the other botanically and to pick up the technique of root dissection and in his place Mr. V. A. Abhyankar, B.Ag., acted.

Mr. D. H. Tagare, Inspector of Agriculture, Sholapur, was deputed for a fortnight to survey the situation of villages coming under Vispur Tank at the request from the Collector of Ahmednagar ; and the report of the survey work done there has been sent.

During the year under report the services of Mr. M. K. Shirole were spared for more than a fortnight to North Central Division for the exhibition at Jalgaon. The services of Mr. V. G. Patwardhan, M.Sc., M.Ag., Assistant Professor of Chemistry, were kept at the disposal of this Division from 16th February to 10th April 1929. He rendered useful services to the cane-growers on Godavari and Pravara Canals and his work has been greatly appreciated by them. The Deputy Director of Agriculture, Southern Division, spared the services of Mr. Mutalik Desai, Bunding Officer, for a week to help in the Land Development Class held at Barsi.

The experiments conducted on Mohol Farm and by the Soil Physicist have evolved the improvements in the method of growing Rabi Jowar which if adopted are found to give an increased yield. These methods have been demonstrated in Sholapur and Poona Districts with additional staff of two temporary Kamgars. Similarly, in Nagar District the

District Agricultural Show held this year has popularised this method. As a sequence of the show the District Agricultural Show Committee has come forth with a grant of Rs. 2,000 to work these improvements through the villages. The Director of Agriculture has also sanctioned an establishment of three temporary Kamgars and the scheme has been launched.

These increased activities in the famine areas and response from both local bodies and cultivators are clear indication of the success of improvements and to meet this work, increased permanent establishment is essential.

Similarly other method advocated for securing a crop in these famine areas is bunding on proper lines. For this work, as per Government Resolution, Revenue Department, No. 6275/24 dated 21st June 1926 a Bunding Officer has been appointed who has just commenced his work since last year. It is found that his help is badly needed by cultivators and he is unable to meet with their demands. Land Development is a perfectly new line of work which requires researches to be conducted side by side and hence there seems a great necessity of additional Bunding Officer and the required staff for his office without which his services could not be efficiently utilised.

This Division has a control of four main canals, and Irrigation Agriculture has formed a very important subject, the researches of which are all conducted on the Manjri Agricultural Research Station. The present staff is found not to meet with the requirements owing to several types of questions arising every day about Irrigation Agriculture and unless an additional graduate and non-graduate is supplemented, the scientific record required cannot be maintained up-to-date.

The Nira Right Bank Canal has now commenced its work and the establishment which had already received the administrative approval of Government in Government Resolution, Revenue Department, No. 2008/24 dated 25th November 1924 requires to be provided for early.

These increased activities have naturally increased my office work and unless the office establishment is supplemented and encouraged, the work cannot be coped with.

The chief characteristic feature of the season on the two main canals, Godavari and Pravara, was the appearance of frost, which caused heavy damage to crops like Cane, Tobacco, Grapes, Wheat, etc. There was a severe cold on 31st January and 1st and 2nd February 1929 when ice was found to be formed. The work done has been reported separately.

Lines of Work

The operations of this Division are summarised under the same following heads as it was done last year to facilitate references and comparisons where needed :—

- (I) Research.
- (II) Propaganda

(III) Agricultural Organizations :—

- (A) Taluka Development Associations, and
- (B) Non-credit Co-operative Societies.

(IV) Agricultural Services—

- (A) Boring Operations.
- (B) Engineering Advice and Assistance
- (C) Pig-killing Operations.
- (D) Field Embankments.
- (E) Presidency Agricultural Show, Ahmedabad.

(V) Agricultural Education.

(VI) Departmental Administration.

Section I .

Research

On Manjri Farm and Baramati Farm there was no frost except abnormally low temperature. But on the Kopergaon Farm the frost did damage to ripe-cane and also to growing cane. On the whole, the season for cane was not so promising as last year.

Manjri Farm.—The line of experiments on this Farm is continued on the same lines as in previous years with only changes is economic doses of farm yard manure and also top-dressings which have been introduced of late as per suggestions in Mr. Bristow's report. The experiments which are showing interesting results have been summarised below and those that have been conclusive have been deleted.

Quantity of Nitrogen required to produce a heavy Crop.—It is now six years that this experiment is being conducted and even this year, the conclusions arrived at last year have been corroborated that the dose of 150 lbs. N. top-dressing has been found to yield an economic crop. The following statement summarises the average yield of cane and gul obtained in different treatment :—

Treatment.	Average yield per acre in lbs. (average of 5 years).	
	Cane	Gul
75 Lbs. N. Top-dressing ..	57,349	8,020
150 " " ..	68,952	9,723
225 " " ..	71,979	9,923
300 " " ..	74,584	9,867

This experiment has now been modified and combined with water quantities to see the effect of combination of less water with less manure and less water and more manure and *vice versa*.

Similar experiment of reduced doses of top-dressing, e.g., 75, 112½ and 150 lbs. N. in quadruplicate series is now outlined since the year under report and the results would be summarised when the cycle is complete.

Efficient and Economic Substitute of Farmyard Manure.—The experiment has been reported in paragraph 2 of Section I of Annual Report of 1926-27. The five years results have been available and it has shown that there seems no necessity of supplementing the same with farm yard manure or cake. The plots that were supplemented have not shown any increased yields. The experiment has been discontinued as conclusive proofs have been obtained. The average yields are summarised :—

Treatment	Weight of cane per acre in lbs.					
	1924-25	1925-26	1926-27	1927-28	1928-29	Average
Sann + Safflower Cake.	73,689	72,362	69,258	67,200	63,476	69,197
Sann alone ..	79,900	68,508	75,079	64,722	61,737	69,989
Sann + Farm Yard Manure.	76,154	71,478	70,614	66,270	63,943	69,692
	Weight of gull per acre in lbs.					
Sann + Safflower Cake.	9,854	9,464	9,342	8,916	8,948	9,305
Sann alone ..	10,682	9,425	9,713	8,903	8,537	9,452
Sann + Farm Yard Manure.	9,854	9,682	9,606	9,182	8,685	9,420

N.B. The quantity of Sann added was as under in different years :—

Year	1925-26	1926-27	1927-28	1928-29	Average
Quantity in lbs. (green matter).	21,054	17,206	24,610	24,829	21,925

Suitable Crops for Rotation with Sugarcane.—In this cycle only one experiment has been complete and the rest are not complete. These will be summarised together when the cycle is complete.

Quantity of Irrigation Water and Interval between two Consecutive Waterings.—These experiments are being continued for further observations as reported in last year's report.

Local Method and Manjri Standard Method of Cultivating Sugarcane.—For comparing with the Manjri Standard Method, Sugarcane crop was grown with old local method, i.e., with heavy doses of manuring and greater number of sets planted in beds. The results obtained are tabulated below :—

Treatment	Weight of canes in lbs.	Weight of gulin lbs.	Brix	Value	Cost	Profit
				Rs. a. p.	Rs. a. p.	Rs. a. p.
(i) Manjri Standard Method.	65,036	9,250	20·51	880 14 3	599 0 0	281 14 3
(ii) Local Method	67,044	9,379	20·28	893 3 3	871 3 0	22 0 3

Even though the yield has been slightly more in Local Method yet the actual profits are far less in comparison with the Standard Method. The water given was measured to each plot, and it was found that the Local Method consumed 138·26 inches against 81·5 inches in Manjri Standard Method. The results are themselves self explanatory that wastage of manure and water could be safely avoided if Manjri Standard Method is adopted, which would leave the land in permanent fine condition.

Selection of Profitable Varieties.—The variety H. M. 544 (Baramati) reported in last year's report was further tried in comparison with other varieties and Pundia. Even though it is late, it has been found to yield well. The results for two years are tabulated below :—

Name of variety	Yield figures of 1927-28					Yield figures of 1928-29				
	Weight of		Brix	Ext-raction per-cent.	Percent-age of Gul to cane	Weight of		Brix	Ext-raction per-cent.	Percent-age of gul to cane
	Cane in lbs.	Gul in lbs.				Cane in lbs.	Gulin lbs.			
H. M. 544 ..	1,02,500	11,575	16·8	73	11·29	79,389	9,652	19·5	63·9	12·1
Pundia ..	80,874	11,905	10·4	78·4	14·7	61,061	8,361	21·14	68·8	13·69

Another variety J. 213 (Medium Cane) was tried from the point of economy in manure and water and it was found to yield 9,682 lbs. gul per acre against 8,361 lbs. Pundia. Further trials are in progress to decide the two main economic points.

Botanical Study in the Field and Chemical Control : Gurhal Operations.—The number of varieties under Botanical study have been reduced and the description of these is being entered according to the new method. With regard to chemical control of Gurhal Operations interesting data has been available which would require to be tabulated in a separate bulletin if the help of Sugar-chemist is made available.

Visitors.—The Farm was visited by the Honourable Ministers for Agriculture Mr. Maulvi Rafiuddin Ahmad and Mr. B. V. Jadhav.

Profit and Loss.—The following statement will reveal the cost of cultivation, value of produce, profits and yield per acre for 5 years as per standard method of Manjri Farm :—

Year	Cost of cultivation	Value of produce	Profit per Acre	Cost per unit of labour	Average yield of gul per acre in lbs.	Rate of gul in lbs. per Rupee
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
1924-25	660 10 6	1,118 6 0	457 11 6	0 11 0	8,947	8
1925-26	635 9 0	926 6 0	290 13 0	0 11 0	9,264	10
1926-27	623 13 0	908 13 0	279 15 7	0 11 0	9,942	11
1927-28	626 8 0	829 2 8	202 10 8	0 11 0	9,950	12
1928-29	598 3 3	885 14 3	292 11 0	0 10 0	9,302	10½

Trial of Berseem.—The western portion of Manjri Farm has a deep black soil and has been found not to respond well to any type of irrigated crops like cane, cotton, and ground nut, etc. Mr. T. F. Main, the present Director of Agriculture, the then Deputy Director of Agriculture, in 1927 suggested to grow Berseem crop (*Trifolium alexandrinum*) which has the following qualities with regard to improving the heavy and salt-affected lands :—

(1) By its growing it may render heavy soils suitable for Sugarcane;

(2) By its growing on non-black land the soil may be improved and Farm Yard Manure requirements may be lessened for non-perennial crops.

To test this, experiments have been lined and Berseem was grown for the last two years. Berseem is an annual crop and has got a good fodder value. The cycle of rotation has not been yet complete; however, the observations made on growth of berseem are summarised below as this is a new crop for the Deccan conditions. It is usually sown in September and October and it gives 4 cuttings till the end of March or April :—

(1) (a) The berseem can be sown on fallow land after the crop of early groundnut is harvested.

(b) The berseem can be sown in cotton crop in October when the last pickings are over.

(2) The yields obtained in each system during the last two years were as under :—

1927-28.	lbs.
(a) 24,104 lbs.	32,623
(b) Tethered	30,206

In the first year the crop being new to these soils did not develop in height as well as in root-system; but in the year under report a maximum total height of 5 feet was attained and fairly good yield was realised.

It is expected that normal yield as is obtained in its home would be possible in the near future in the Deccan. Its effects upon soil improvement are being watched.

Baramati Farm.—The season for cane on the Farm was better than the previous year and the average yield obtained was 10,645 lbs. of gul per acre against 7,429 lbs. In one of the plots maximum yield up to 15,236 lbs. of gul per acre has been obtained this year. This shows the response of the soil to better management.

Varietal Trials of Cane.—The varieties H. M. 544, B. 1528, Java and Stripped Mauritius were compared with D. 109 variety and the results obtained show that H. M. 544 and Java have given better yields than D. 109. The results are summarised below :—

Name of variety	Weight of cane in lbs.	Weight of gul P. A. in lbs.	Corrected brix per cent.	Extraction per cent.	Ratio of gul to cane
(1) H.M. 544 ..	76,793	10,353	18.2	67	13.48
(2) Java ..	79,516	10,980	19.31	60	13.82
(3) D. 109 ..	64,510	9,045	20.85	68	14.02

Diversification Series.—In this series a cycle of three year rotation is introduced with cane as one of the crops and rotation crops introduced are mainly monetary crops. The main object of this series is to see how these rotations work out on financial scale, labour side and as rotations for improvement of land and supplying needs of cultivators, *provided the farm yard manure stock is available on the canals fully to the requirements of cane crop and gul prices favourable.* These rotations were as under :—

	"A"	"B"
1st year	.. Cane	Cane
2nd year	.. Cotton	Rabi jowar
3rd year	.. Nilwa and gram	Groundnut (late variety).

The following are the average yields obtained in each rotation :—

Rotations	"A"			"B"		
	Cane (Gul)	Cotton (seed cotton)	Nilwa and gram (dry fodder)	Cane (Gul)	Rabi Jowar (grain)	Groundnut (Pods)
Yield in lbs. per acre.	11,484	967	7,237	9,474	1,672	1,879

The observations on the above rotations are summarised below :—

(1) The yield of cane after nilwa-gram is superior to that after groundnut.

(2) The "A" rotation has shown slightly more profits than "B" rotation.

(3) Considering the requirement of cultivators, both these rotations can be adopted by cultivators as the mixed type of farming is always a paying concern.

Local versus Manjri Standard Method.—This experiment was tried for three years and the cycle of rotation has been complete. It is found that the yields of cane are higher in Local Method than Manjri Standard Method; yet the profits are in favour of Manjri Standard Method.

Kopargaon Farm.—On the Farm, the crop was affected to some extent by frost, but the affectation was not so severe as it was on Godavari and Pravara Canals in cultivators' field. The yield of gul per acre of Plant and Ratoon was 10,248 and 8,673 lbs. against 11,363 and 10,172 lbs. of 1927-28.

Varietal Trial of Canes.—The varieties D. 109, H. M. 544, Manjav and Java were tried with Pundia for the past season and the yields obtained of D. 109, H.M. 544 have been tabulated below in comparison with Pundia.

Name of variety	Yield of gul in lbs. per acre		Yield of gul in lbs. per acre	
	Plant (1926-27)	Ratoon (1927-28)	Plant (1927-28)	Ratoon (1928-29)
D. 109	11,636	9,604	10,068	9,008
H.M. 544	10,971	10,704	7,788	8,232
Pundia	10,634	9,944	12,448	9,004

It will be seen from the above statement that the response of H. M. 544 is spasmodic; in one cycle it has shown its equality with D. 109 and Pundia and in the 2nd cycle it stands low. Even though the variety is late, there are certain vagories which require a study for one or two more cycles when a final opinion can be given. These two points are (1) securing a first class germination, and (2) proper time of harvest.

Manjri versus Local Method of Growing Cane.—On Godavari Canal the local practice is to have a Ratoon crop of cane. The Manjri Standard Method has proved its value from economic point of view in Plant Cane, but how it would respond with the above conditions, the said experiment was conducted. The only change made in Manjri Standard Method was the increase of Top-dressing from 150 to 200 lbs. N., both to Plant and Ratoon Cane, all other items being kept the same. In

the Local Method, the Plant and Ratoon received heavy doses of top-dressings. The yields obtained in two cycles are tabulated below :—

Treatment	Yield of Gul per acre in lbs.		Yield of Gul per acre in lbs.		Profit in each cycle for 2 years	
	Plant (1926-27)	Ratoon (1927-28)	Plant (1927-28)	Ratoon (1928-29)	1926-27 and 1927-28	1927-28 and 1928-29
(1) Manjri Standard method plus (200 lbs. N).	10,634	9,944	12,448	9,004	Rs. 425	Rs. 784
(2) Local method	12,034	9,904	12,524	8,664	275	419

From the above statement it will be seen that even though there is slight difference in yield, yet the profits are greater in the Manjri Standard Method and the doses given seem commensurate to reap a normal crop. The great disadvantage observed on the Farms with the local method of growing Cane is that even though tonnage is more, due to low brix the yields of Gul are proportionately low and this fact accounts greatly for the unnecessary losses of cultivators.

Nitrogenous Top-dressing.—On this Farm, the economic dose of top-dressing proposed was 200 lbs. N. both for Plant and Ratoon and it was compared with 250, 300 and 350 lbs. N. Results of two cycles have been available and they show that the dose of 200 lbs. nitrogen is the economic dose of manure ; it has given an average yield of each cycle, 11,954 and 10,566 lbs. of Gul per acre (cycle is of 2nd year and consists of Plant and Ratoon Cane).

Mohol Plot.—The lease of this plot has been continued for a further period of ten years and the necessary bunding has been done as is required according to the slopes, without dividing the plot into too small units. The season was again unfavourable for Cotton in spite of rains in June and was too wet in the beginning for Jowar. The yields of Cotton and Jowar obtained were 192 lbs. seed-cotton and 558 lbs. of Jowar per acre against 147 lbs. seed-cotton and 413 lbs. Jowar of the past year.

Graded versus Ungraded Seed.—This is the 3rd year of experiment on this Farm and even this year the graded seed plot has corroborated the results obtained during the past two years. The results of this year and the average of past three years are summarised below :—

Serial No.	Treatment	Yield for 1928-29			Average for past 3 years, i. e., 1926-27., 1927-28 and 1928-29		
		Average No. of plants per acre	Yields per acre		Average No. of plants per acre	Grain lbs.	Fodder lbs.
			Grain lbs.	Fodder lbs.			
1	Seed graded with sieves.	19,982	1,110	1,520	23,389	932	1,397
2	Ungraded ..	16,644	861	1,106	19,218	662	1,037

The average of the past three years shows advantages in yield and also in the vitality of the plants in graded seed. Mr. D. H. Tagare has made the following observations by conducting an experiment of academic interest to test the germination and vitality during the period of growth.

(1) The germination of graded seed was found to be 56.4 per cent. against 41.7 per cent. of ungraded.

(2) The withering of plants from germination till harvest in graded and ungraded were found to be 0.6 per cent. or 1 in 150 plants against 6 per cent. or 1 in 17.

Evil Effects of Soil Erosion.—These have been recorded and they corroborate last year's observations. A regular record for a period of years is thought of maintaining on this Farm.

Experiments conducted of dry-farming by Soil Physicist and of the use of Sulphur Dust against Smut by Plant Pathologist would be reported separately by the officers concerned in their respective annual reports.

Section II

Propaganda

The principle items of programme of the District Staff are as under :—

(a) *The Popularization of the Copper Sulphate Treatment for Jowar against Smut.*—Intensive propaganda for distributing copper sulphate packets by means of demonstration and lectures, etc., was done as usual with the help of revenue and irrigation officers and the number of packets distributed for each district was as under :—

Name of district	No. of packets distributed in 1928-29
(1) Ahmednagar	5,217
(2) Sholapur	4,331
(3) Satara	1,973
(4) Poona	1,465
(5) Canal Area (including N. R. Bank Canal) ..	3,948
Total ..	16,934

(b) *Introduction of New Crops and Varieties.*—(a) Introduction of Sugar-cane varieties in the Canal tract.—As reported in last year's report, there were more trials with H. M. 544 to see how it responds. The season on the Godavari and Pravara Canals was a bad one as the Frost had affected the cane-crop very badly and the losses were severe and hence the yields in demonstration plots bore the same fate on these two Canals. The crop on the Nira Canals was not affected.

On the Nira Left Bank Canal, the variety has again shown to be good yielding like Pundia and in one case a high yield of 12,700 lbs. has been

recorded. The average yields in comparison with *Pundia* on different Canals stood as under :—

Varieties.	Nira Left Bank Canal.	Godavari Canal.	Pravara Canal.	Nira Right Bank Canal (on well irrigation).
	Lbs.	Lbs.	Lbs.	Lbs.
H. M. 544, Plant ..	10,158	7,408	8,320	7,952
Ratoon ..	....	6,385	....	....
<i>Pundia</i> , Plant ..	10,315	8,191	10,000	7,088
Ratoon ..	....	6,740	....	....

On Pravara Canals, H. M. 544 as *Adsali* harvested after 19 months in November has yielded 13,031 lbs. Gul per acre. Owing to lateness of the variety, which time does not suit in the Irrigation rules, the area under this has this year consequently decreased and the area under H. M. 544 stands as under when compared with last year on different Canals :—

Name of Canal.	Standing area under H. M. 544 planted in 1928-29.		Area planted and Ratoon under H. M. 544 in 1929-30.	
	A.	g.	A.	g.
(1) Nira Left Bank Canal ..	200	0	93	10
(2) Nira Right Bank Canal ..	1	20	0	25
(3) Pravara Canals ..	8	0	2	15
(4) Godavari Canals ..	25	0	57	35

(b) *Introduction of N. R. Cotton on Canal Area, Nagar and Sholapur Districts.*—The year was not so favourable for Cotton as the previous year owing to abnormal heavy falls in September which caused heavy shedding of bolls. The average yields obtained from demonstration plots was as under on different Canals :—

Name of Canal.	Average yield of seed cotton per acre in 1928-29.
	Lbs.
(1) Nira Left Bank Canal ..	772
(2) Nira Right Bank Canal ..	1,018
(3) Godavari Canals ..	735
(4) Pravara Canals ..	807

Maximum yields varying from 1,200 lbs. to 1,691 lbs. were obtained by a very few cultivators.

The area under N. R. Cotton was on an increasing scale on all Canals as the water was made available to sow Cotton in May.

Arrangements were made to distribute the following N. R. Seeds besides the 20,000 lbs. of seed produced from N. R. Seed brought from Jalgaon Farm :—

Name of Canal.	Quantity of N. R. Seed.
	Lbs.
(1) Nira Right Bank Canal	8,000
(2) Nira Left Bank Canal	18,200
(3) Godavari Canals	50,800
(4) Pravara Canals	11,274

In addition to this, local merchants are importing seed and making arrangements for distribution of the same.

Nagar and Sholapur Districts.—The advantages of N. R. seed are now too well known to cultivators of Nagar and Sholapur Districts and the following quantities were distributed during the year under report :—

District.	Quantity of N.R. Seed distributed in lbs.
Nagar	13,440
Sholapur	7,814

(c) *Introduction of Ground-nut varieties.*—The following statement shows the distribution of the different varieties of Ground-nut :—

Name of variety.	Quantity distributed in each District.		
	Satara.	Nagar.	Canal Area.
(1) Spanish Peanut .. .. .	....	1,920	18,840
(2) Fresh Pondichery	500	....	2,450
(3) Small Japan .. .. .	....	....	14,525

Early varieties have been spreading in Nagar and part of Poona and Canal area.

(d) *Introduction and dissemination of Akola Bajri.*—The importance of this variety is by now fully realised by cultivators in this Division

and hence this year 4,084 lbs. fresh seed of Akola Bajri from Nagar District was exported for distribution.

(e) *Introduction of New Crops like Pusa-4 Wheat, Potatoes, Ginger Crops and Tobacco on Canal Area :—*

(a) *Pusa-4 Wheat.*—The variety has been found to settle on Canals and at several places in Poona, Nagar and Sholapur Districts on well-irrigation. It has yielded well and is found fairly free from Rust resistance. There is great difficulty of importing new seed from Pusa and it is felt that fresh seed to some extent needs to be imported every 3rd year.

(b) *Ginger.*—2,900 lbs. of Ginger seed was distributed on Canals. It was found that the crop ripened earlier and yielded on an average 3,000 lbs. per acre. The yield is poor and it seems further trials are essential.

(c) *Potatoes.*—The crop has been found to yield well in Rabi season. Several cultivators had managed to grow potatoes and the average yield obtained was 10,000 lbs.

(d) *Tobacco.*—The crop suffered badly owing to frost on Godavari and Pravara Canals. The area under this crop was 150 acres on all Canals and help was rendered to cultivators by means of special tobacco specialist brought from Nipani from raising seedlings to curing process, and the benefit was taken by all tobacco growers on the Canals. The yields obtained of Nipani variety varied from 500 to 1,005 lbs. cured tobacco per acre.

(f) *Introduction of Improved Methods in Sugarcane growing (Canal-Area) Java Methods :—*

(a) *Sugarcane Growing.*—(i) Wide method of planting Cane and (ii) reduction of sets. The propaganda is being continued by having demonstration plots and the Cane-growers are adopting this, according to the suitability of the soil and other environments.

(b) *Java Method of Planting Cane.*—The area under Cane with Java method of planting during the year on different Canals was as under :—

Name of Canal.				Area under Java method.
				Acres.
(1) Nira Left Bank Canal	..	..	..	6
(2) Godavari Canals	..	..	..	13
(3) Pravara Canals	..	..	..	12

(g) *Spraying and Fumigation Operations.*—The potato-growers have realised the importance of spraying Potato-crop against Tambara disease in Khed Taluka. The Taluka Development Association, Khed, sprayed 17 acres and 10 gunthas and recovered Rs. 20-12-0 as fee. The

departmental Kamgar at Saswad also sprayed 6 acres crop of Potatoes.

(h) *Grasshopper Campaign*.—The attack of wingless Grasshoppers was not so severe as last year in the Eastern portion of Satara District. But attempt was made to see the effectiveness of the method of using Tin-sheets with Tar. The experiment was conducted over an area of 177 acres. The cost of operation per acre came to Rs. 4-11-0 as under:—

			Rs. a. p.
(a) Labour charges	..	..	2 13 0
(b) Coal-tar, Kerosine, tin-sheet, etc.	..	..	0 14 0
(c) Supervision charges	..	..	1 0 0
			4 11 0

The comparative yields of protected and non-protected areas were as under:—

Description.	Yield of Jowar per acre in lbs.			Value.
	Grain.	Fodder.	Chaff.	
				Rs. a. p.
(1) Protected	480	1,000	40	27 0 0
(2) Non-protected	48	1,000	10	6 4 0

(i) *Horticultural Operations*.—The area of different varieties of fruits like Chikoo, Figs, Grapes, Lemons, etc., on Canals is increasing. At Hanthurna with the help of Irrigation Department varieties of Figs have been planted by the Horticulturist to Government, Bombay Presidency, Poona, and some of them seem to be promising.

In Satara and Sholapur Districts propaganda of budding of Bor trees is in full swing and hundreds of plants have been budded.

(j) *Implement Depôts*.—The total hire received from Implement Depôts amounted to Rs. 899-8-0. The honorary workers who rendered good services in recovering hire at a very low commission charges for number of years have been awarded silver medals. The following are the persons who were awarded silver medals—

(1) Mr. S. S. Machale, Pandeshwar, Poona District.

(2) Mr. W. G. Thakar, Khed-Shivapur, Poona District.

(k) *Sir Sassoon David Trust Fund*.—As reported in last year's report, a sum of Rs. 1,500 was made available for conducting manurial experiments on Cotton and these were conducted on all the four Canals and

Sholapur District (for Cotton under well irrigation). The following statement shows the results obtained :—

Treatment.	Nira Left Bank.		Nira Right Bank.	Godavari Canals.	Pravara Canals.	Sholapur District.
	Average yield of seed-cotton per acre in lbs.		Average yield of seed-cotton per acre in lbs.	Average yield of seed-cotton per acre in lbs.	Average yield of seed-cotton per acre in lbs.	Average yield of seed-cotton per acre in lbs.
	Perennial blocks after cane.	8 months' blocks.	8 months' blocks.	After 1st Ratoon of Cane.	After 1st ratoon of Cane.	Under well irrigation.
I. (a) Sulphate of Ammonia - 25 lbs. N. = Rs. 10.	1,067	931	1,178	....	....	....
(b) Sodium Nitrate 25 lbs. N. = Rs. 18.	1,167	950	1,227	....	....	....
II. (a) Castor or Safflower - 15 lbs. N. plus Ammonium Sulphate 20 lbs. N. = Rs. 23.	....	....	....	940	904	1,181
(b) Castor or Safflower - 15 lbs. N. plus Sodium Nitrate 20 lbs. N. = Rs. 29.	....	....	....	935	990	1,174
III. Check with no artificials or any of the above doses.	867	677	1,018	755	807	908

Notes.—These are averages of several plots managed.

This year owing to abnormal rains the yields have been vitiated.

The results are for one year and they require further trials for corroboration.

(l) *Remedies against Damage of Crops due to Frost.*—In this Division the following statement shows the temperatures recorded at different places on 31st January, 1st and 2nd February 1929 when in certain tracts like Godavari and Pravara Canals, ice was formed and all crops damaged. But at other places the mean temperature was not so low and would have affected the growing crop but rain followed, which saved the situation :—

Temperature.			Kopargaon Farm.			Manjri Farm.		
			31st.	1st.	2nd.	31st.	1st.	2nd.
Maximum	..	..	79°	70°	75°	82°	83.5°	77.5°
Minimum	..	..	44°	34°	35°	45°	38°	39.5°

Temperature.	Baramati Farm.			Sholapur.		
	31st.	1st.	2nd.	31st.	1st.	2nd.
Maximum	80°	71°	77°	82·5°	82·3°	79·5°
Minimum	41°	44°	52°	54°	49·9°	53°

The damage due to frost was of a severe nature on the Godavari and Pravara Canals whilst in other places it was not severe. The main crops damaged on the Canals, were Cane, Tobacco, Wheat and Fruit-trees like Plantains, Grapes, Popayas and Figs. The Cane-grower was badly hit owing to the damage being of a severe nature which caused stopping of further growth which resulted in (1) sprouting of eye-buds, (2) increase of fibre in Cane and (3) deterioration of Gul quality ; and similar was the case with the fruit-growers. Immediately after the dates of frost, at the request of Mr. N. S. Borawake, a big Cane-grower and Member of the Deccan Divisional Board of Agriculture, a committee of the following persons was appointed by the Director of Agriculture, Bombay Presidency, Poona, to see the actual conditions and suggest remedial measures :—

- (1) Rao Saheb B. P. Vagholkar.
- (2) Mr. V. V. Gadgil.
- (3) Dr. B. N. Uppal.
- (4) Mr. G. P. Patil.

The committee submitted a report to the Director of Agriculture within a fortnight.

The Collector, Ahmednagar, and the Executive Engineer felt a sheer necessity of having the information to their subordinate staff to judge the damages and advocate remedies. The department had thus two functions to perform immediately within a short time.

- (1) Supplying information to all subordinate officers about the losses in Cane.
- (2) Propaganda for remedial measures.

The 1st was done by preparation of special Notes which were supplied both in English and Marathi to both the Departments.

As for 2nd, the Director of Agriculture, Bombay Presidency, Poona, spared Mr. V. G. Patwardhan and two temporary Kamgars. The Divisional Superintendent of Agriculture, Deccan Canals, Baramati, with the help of Professor V. G. Patwardhan arranged 30 demonstrations of gul-making. The Cane-growers who could not get solid gul from affected canes, were actually benefitted by getting money returns from the marketable gul obtained by the process demonstrated by Professor V. G. Patwardhan. The method found by Professor Patwardhan was thus very much appreciated by Cane-growers. Besides this, two leaflets, (1) suggestions to the Cane-growers on the Godavari and Pravara Canals

regarding the preparation of better quality of "GUL" from cane affected by frost and (2) Suggestions to the Cane-growers on the Godavari and Pravara Canals regarding use for planting of the Cane-sets sprouted by the frost, were published and 10,000 copies of each were distributed through Révenue and Irrigation agencies. The propaganda being in time was very effective. Side by side Professor V. G. Patwardhan studied the deterioration in Cane and Gul owing to frost and Dr. Uppal studied the action of Rot at different periods, which would be reported by them separately.

(m) *Shows and Demonstrations.*—The Agricultural propaganda is conducted through the following methods :—

(1) Organised shows, (2) Demonstration of Implements, Manures, new varieties of crops, steeping and spraying as a means to prevent diseases of crops, (3) Jamabandi demonstrations and (4) Organisation of dépôts of Implements and manure and seed societies for purchase and sale of cultivators' produce.

(i) *Organized Shows.*—The District Agricultural Show Committee, Nagar, collected 1,000 Rupees and arranged a show smaller in size than that was held last year in January. Crops were grown as per dry-farming method and with graded seed, which were again impressive like last year and the yields obtained are in favour with the improvements advocated. The show was held for only 3 days during which time nearly 20,000 cultivators were found to have visited and 2,000 exhibits were received. The following list shows the amounts distributed as prizes in each section :—

Name of section.		Prizes distributed in the form of medals and cash.	
			Rs.
(1) Crop section			760
(2) Live-stock section			900
(3) Machinery section			400
(4) Sports section			500

(ii) *Items (2), (3) and (4) mentioned above.*—Demonstrations have been reported separately in the summary of work of each District while information in respect of (4) is given under the work of Non-credit Societies mentioned in Section III of this report.

(n) *Land Development Class at Barsi.*—In the uncertain and deficient rainy tracts, the conservation of the precipitated moisture in the soil is of utmost importance. This is effected by Bunding or Tals to make land level so that moisture in the soil is evenly made available to the growing crop. Successful bunding or Tal-laying requires thorough knowledge about the amount of soil erosion by rain, length, breadth and height of the Bund or Tal required, the proper situation of waste-weir and the material to be used, etc. In order to impart these points a class was organised at Barsi for a week from 21st January 1929. A month before the date of class it was advertised in all local newspapers and as a result the following candidates from different parts took the benefit of the class. In addition to cultivators, departmental as well as association staff was deputed for

the class so that they would be of use in the tracts where they have been working :—

Description.	Places from where candidates attended.						Total.
	Poona.	Nagar.	Satara.	Sholapur.	Belgaum.	Jamkhind State.	
Cultivators and Landlords ..	2	3	1	33	3	6	48
Revenue officials like Circle Inspectors, Patils and Talatis ..	..	..	..	18	..	..	18
Tahuka Development Association staff ..	..	..	5	5	..	..	10
Departmental staff ..	1	4	1	2	..	..	8
Total ..	3	7	7	58	3	6	84

The arrangement of teaching was by lectures in the morning and actual practical work in the noon. The services of Mr. Motalik Desai, Bunding Officer, Dharwar, were demanded for conducting and helping the Bunding Officer of this Division and his experience was of great use to the cultivators. The cultivators appreciated the instructions and returned home well informed.

(c) *Leaflets*.—During the year the work of writing new leaflets and revising old ones was entrusted and the work completed during the year is summarised in the following statement :—

Serial No.	Name of leaflet.	English.	Marathi.
<i>New leaflets.</i>			
(1)	Effluent as a manure for Sugarcane ..	1	1
(2)	Effluent as manure to Vegetable, Betel-vine and fodder crops ..	1	1
(3)	Effect of comparative rotations on Sugarcane ..	1	1
<i>Revised leaflets.</i>			
(4)	The polishing of Turmeric for market ..	..	1
(5)	Proper planting of Cane-sets ..	1	1
(6)	Prickly pear as fodder ..	1	1
(7)	Sugarcane crushing ..	1	1
(8)	Earthing up of Sugarcane by Sabul plough ..	1	1
(9)	Manjri Farm Single Bullock Yoke ..	..	1
(10)	Sugarcane ..	1	1
(11)	Tambora Disease of Potatoes ..	1	1

Note.—In addition to these, two leaflets, (1) note on Storage of F.Y. Manure in villages and (2) note on cultivation of Rabi Jowar according to the new method known as dry-farming, were written for District Agricultural Show Committee, Ahmednagar. Also a summary of 10 years' work on Mohol Farm has been submitted for printing in the form of Bulletin.

(p) *Summary of work done in each District and on Canal Area* :—

(1) *Poona District*.—The work of demonstrating crops was conducted on the same lines as mentioned in paragraph 37 of last year's Annual report. Spanish Peanut in Saswad Taluka has yielded on an average

1,170 lbs. dry pods per acre. Kolamba strain, though it is giving equally good yield like Ambemohar, it is found that in the Ambemohar tract it has no scope of spreading. Pusa-4 Wheat under irrigation has yielded 1,433 lbs. grain against 1,020 lbs. of Baxi wheat. Experiments conducted with Rabi Jowar, grown according to dry-farming methods, have shown the following average yields :—

Treatment.	Yield per acre in lbs. of	
	Grain.	Fodder.
(1) Dry Farming method ..	867	2,430
(2) Local method ..	473	1,556

Jowar seed was graded for an area of 100 Acres and demonstrated. 8 Crop and 23 Implement demonstrations were organized and held. Besides, several steeping and seed grading demonstrations were held. The District Agricultural Overseer, Poona, contributed 3 articles to the Shetki and Shetkari Magazine and rendered help to the Taluka Development Associations, Khed and Junnar.

(2) *Ahmednagar District*.—Like last year a show smaller in size was organized and plots were made to show better methods of growing Jowar. The yields obtained this year have been again interesting and hence these are summarised below :—

Serial No.	Name of crop.	Object of the plot.	Outturn. per acre		Remarks.
			Grain.	Fodder.	
			Lbs.	Lbs.	
I (1)	Jowar	Local plot	1,100	4,020	Sown with seed drill 9" apart and one inter-culturing.
(2)	Jowar	To show the advantage of interculturing.	1,728	5,280	Sown with seed drill 9" apart and 3 inter-culturings.
(3)	Jowar	To show the advantage of dry farming.	2,860	6,000	The plot was bundled and sown with 18" seed-drill with graded seed and given 5 interculturings.
II (4)	Jowar	Local plot	1,260	4,544	Sown with seed drill 9" and one inter-culturing.
(5)	Jowar	To show advantage of wide sowing.	2,400	7,200	Sown with seed drill 18" apart and one interculturing.
III (6)	Jowar	To show advantage of grading.	2,088	6,600	Sown with 18" apart and graded seed.
(7)	Jowar	Check plot	1,260	5,544	Sown with non-graded seed as above.

The better methods have again shown superiority. Besides this show, the usual propaganda was conducted in the District on the same lines as last year. Kolamba Strain has yielded 1,192 lbs. against local 850 lbs. Paddy. Pusa-4 Wheat under irrigation has yielded 1,050 lbs. grain against 816 lbs. N. R. Cotton has given an yield varying from 420 to 600 lbs. against 240 to 320 lbs. of Local mixture of seed cotton. Advantages were shown by grading seed of Rabi jowar. The graded seed plots of

Rabi Jowar yielded 486 lbs. Jowar against 500 of ungraded on an average.

Nine Jamabandi Demonstrations, 6 crop and 25 Implement demonstrations were organised and held. Besides, nearly 36 steeping demonstrations were arranged. He helped the Implement Societies of Shevgaon, Pathardi and Jamkhed and also at Ruichatisi (an unregistered body which recovered Rs. 400 as hire of implements). He worked as Secretary, District Agricultural Show, Nagar, on the Crop-court and Exhibit section.

(3) *Satara District*.—In Satara District there are 10 Associations, which are solely guided by the District Agricultural Overseer and his staff and hence that forms the main duty. In addition to the Association work, several plots for demonstrations of new crops, manures were arranged. 7 Jamabandi Demonstrations, 12 crop demonstrations and 9 small shows at different fairs were organised and helped.

(4) *Sholapur District*.—During the year, 7 Jamabandi, 2 special Bunding, 50 seed-grading, 10 inter-culturing and 11 crop-demonstrations were organized. The special propaganda mentioned in paragraph 40 of last year's report regarding seed grading was continued this year also. 90 plots were kept under observation at different centres of graded vs. non-graded Rabi Jowar seed and the results have been recorded. The average yield of all was as under in comparison with last year :—

Treatment.	Yield of 1927-28 in lbs.		Yield of 1928-29 in lbs.	
	Rabi jowar dry.	Rabi jowar irrigated.	Rabi jowar dry.	Rabi jowar irrigated.
(1) Graded seed	1,009½	1,874	758	1,030
(2) Non-graded seed	737	1,564	458	650

In the year percentage of increase has varied from 30 to 89 against 26 to 73 of 1927-28 in Dry and 43 to 77 against 16 to 25 in irrigated crop.

As a result of this propaganda, the number of sieves sold this year was 574 and several cultivators have commenced to grade the seed before sowing. In the Sholapur District, 1,297 bags of Jowar seed=290,528 lbs. in addition which could be recorded of Rabi jowar was found to have been graded. It is presumed the actual quantity is now much larger. In Barsi Taluka alone, as a result of last year's propaganda by a special Kamgar, it is found that at 13 villages nearly 12 per cent. area of Jowar seed was grown by cultivators with graded seed.

Besides this, the new crops like Pusa-4 and Akola Bajri were tried. Pusa-4 has yielded 500 lbs. as a dry crop and 1,300 lbs. as an irrigated crop and it was found free from rust.

Help was given to the Taluka Development Associations and Implement Societies.

(5) *Canal Area*—(This includes Nira Right Bank, Nira Left Bank, Godavari and Pravara Canals).—On the Canals, 27 demonstrations were held to show the advantages of N. R. Cotton, Tobacco, Potato, Ginger, Fruit culture, seed-grading in Jowar, wide method of planting and consequent reduction of sets, Java method of planting Cane, and San-green manuring. These were largely attended by cultivators and the benefits are being realised. In addition to the above work, special work was required to be done on Godavari and Pravara Canals owing to frost, of demonstrating making good quality Gul from affected Canes. Nearly 30 demonstrations were done on Godavari and Pravara Canals where the cane was badly affected. The staff arranged to grade 20,526 lbs. seed of Jowar and the yields obtained of graded and ungraded seed on different canals averaged from several demonstration plots as under :—

Name of Canal.	Yield of Rabi Jowar (under irrigation) per acre.		Increase of yield per cent.
	Sown with graded seed.	Sown with non-graded seed.	
	Lbs.	Lbs.	Per cent.
(1) Nira Left Bank Canal ..	1,213	1,058	15
(2) Nira Right Bank Canal ..	810	710	14
(3) Pravara Canals ..	1,281	1,095	17

In the Java method of planting Cane the yield obtained was 8,840 lbs. Gul of Plant and 7,980 lbs. of Ratoon. The yield is low as Cane suffered from Frost. Recently it has been found that practice of Adsali Cane planting has been in much vogue on all Canals. The fields were maintained under observation and regular yields were recorded of several plots on Nira Left Bank Canal. The yields vary from 12,304 to 14,096 lbs. of Gul per acre.

Section III

AGRICULTURAL ORGANISATIONS

(a) *Taluka Development Associations*.—During this year the total number of Taluka Development Associations was 15 ; the three new Associations, Purandar, Shevgaon and Sangamner, were ripe for registration, but as per Government Revenue Department Memorandum No. 9805-A/24 dated 24th November 1927 formation of new Associations is not encouraged. The Associations experienced great difficulty in getting full subsidy in time and hence the actual work of some Associations who had short funds was hampered.

The work has been continued on the usual lines but more importance is now-a-days given to local problems and these are worked out on an

extensive scale. Some Associations have added useful quota to their record which is summarised below :—

Poona District

(1) *Nira Left Bank Canal Agricultural Development Association.*—The Association distributed the following quantities of seed :—

	Lbs.
(1) N. R. Cotton	18,200
(2) Spanish Peanut and Japan Small Ground nut	6,290

and did other useful work side by side. The sub-branch at Ghotandi did useful work in hiring out implements and recovered Rs. 191-4-6 against Rs. 106-9-6 of the last year as hire.

(2) *Khed Taluka Development Association.*—The Association recovered as a hire from implements Rs. 121-0-6 and helped the cultivators for spraying Potato crop against Tambara in 24 villages.

Sholapur District

(1) *Madha Taluka Development Association.*—At 26 villages, 30,916 lbs. of Jowar seed was graded and sown. 2,288 packets of Copper Sulphate were distributed and 15 drills of 15" width were introduced for sowing Rabi Jowar. The total number of 15" width Drills used is 200. The Association did supervision of Co-operative Credit Societies.

(2) *Karmala Taluka Development Association.*—The Association has demonstrated the use of graded seed and it has been fully appreciated by cultivators. At 59 villages, 64 sets were maintained and the Fieldman sieved 135,000 lbs. of Jowar seed. At 18 villages, 15" drill has been again demonstrated and it is reported that this has been adopted by the cultivators and nearly 1,000 drills of 15" width are in vogue. The Association did supervisory work of Co-operative Credit Societies.

Satara District

(1) *Koregaon Taluka Development Association.*—This Association conducted the Pig Campaign work in 40 villages. The Association arranged for supply of good seed of Potatoes for Kharif planting and imported 47,000 lbs. Potato seed from Khed.

(2) *Wai Taluka Development Association.*—The Association hired out implements and recovered Rs. 268-11-0 as hire. Thus, the implement section served the needs of 118 cultivators in 36 villages. Arrangements were made to supply a large quantity of Kharif Potato seed by importing the same from Khed. Nearly 75 demonstration plots were arranged to show advantages of different crops.

(b) *Non-Credit Societies.*—The following statement will show the work done in the year by the Non-Credit Societies which have been

working. The rest of the non-credit societies have not developed work as yet:—

Name of Society.	Value of produce sold.
	Rs.
"A"—Sale Societies.	
(1) Haveli Taluka Agricultural Sale Society ..	3,15,985
(2) The Warna Valley Co-operative Sale Union, Ltd., Islampur	2,34,108
(3) Sholapur District Co-operative Sale Union, Kurduwadi	1,38,439
(4) Nira Canals Societies Purchase and Sale Union .	55,615

"B"—Manure Societies.

	Value of manure purchased and distributed.
(1) Manjri Budruk Co-operative Manure Society ..	3,963
(2) Hadapsar Co-operative Manure Society ..	7,422

"C"—Implement Societies.

	Hire recovered.
(1) Shevagaon Co-operative Implement Society ..	/ 518
(2) Pathardi Co-operative Implement Society ..	1,954
(3) Jamkhed Co-operative Implement Society ..	729
(4) Ruichatisi Co-operative Implement Society (un- registered)	400
(5) Tadwale Implement Society ..	222
(6) Shri Vithal Implement Society, Madha ..	176
(7) Pandharpur Implement Society ..	72

(c) *Nangaon Co-operative Irrigation Society*.—The difficulties experienced in the past about recovering the amounts of dues were continued. The members flatly refused to accept the terms as they found the charges too heavy and hence the society was proposed for cancellation. The Plant was worked and water was allowed to those who demanded it at the rates settled by the Department. The area under different crops was as under during the year under report.

Description of crop.	Area.
	A. g.
Perennial	22 0
Kharif	22 20
Rabi	31 20
Single watering	18 0
Miscellaneous	2 0
Total ..	96 0

The Engine worked for 1,730½ hours from 12th June 1928 till 31st May 1929, i.e., till the time when it was closed. The total recoveries amount to Rs. 2,139-8-0. The plant has been closed for irrigation from 31st May 1929.

Section IV

Agricultural Services

The services under this head can be mentioned in the following form :—

Section IV-A

Boring Operations.—In the year under report, 5 boring machines were working for the whole period and one machine worked for 6 months only and remained idle for the remaining period as the Engine had become old. The demand for machines from Nagar District has been decreasing owing to good distribution of rainfall in that District for the last three seasons. The total number of bores worked with the machines was 50 including 5 remaining on hand of last year. Out of these, only 16 were successful and 28 were unsuccessful. The percentage of successful bores was 35·5 per cent. The total footage bored with the above machines was 4,615·6" as against 5,150·11" owing to one machine not working for 6 months. The average number of working days of each machine, leaving aside the days for shifting, fitting, marketing, etc., were 174·2 as against 172 of last year.

The suggestion made by the Assistant Boring Overseer, Mr. Govande, and reported in last year's annual report about taking out sludge from the bore is receiving attention of the Agricultural Engineer and if it turns out satisfactory, one of the great economic questions will be solved in that line. On similar lines, Mr. Govande is working on certain points for further study this year.

The details of the working of these machines are tabulated below :—

Statement showing the details of bores

Serial No.	Name of well Master	Taluka	Village	Diameter of Bore	Depth of Bore in feet	Water after Boring in gallon per hour
<i>Poona District</i>						
1	Mr. B. D. Sethana ..	Haveli ..	Yerwada ..	4"	205'-0"	No water
2	Mr. Ganpati Martand Satav ..	Bhimthadi ..	Jalochi ..	4"	86'-0"	Do.
3	Mr. H. V. Tulpule ..	Naval ..	Vadgaon ..	4"	80'-0"	75 Gallons
4	Miss Baby Saffunnleaw ..	Khed ..	Manchar ..	4"	240'-0"	Feeble Current.
5	Mr. P. B. Apte ..	Do ..	Khed ..	4"	75'-0"	Do.
6	Do. ..	Do. ..	Do. ..	4"	205'-0"	No water
7	Mr. K. B. Gokhale ..	Naval ..	Vadgaon ..	4"	70'-0"	Feeble Current.
8	Mr. V. G. Phansalkar ..	Do. ..	Do. ..	4"	68'-0"	Do.
9	Mr. V. G. Dalvi ..	Do. ..	Kamshet ..	4"	84'-0"	Do.
10	Mr. D. S. Sardesai ..	Do. ..	Do. ..	4"	63'-0"	Do.
11	Mr. G. S. Sardesai ..	Do. ..	Do. ..	4"	60'-0"	100 Gallons
12	Mr. K. S. Paranjpe ..	Do. ..	Do. ..	4"	145'-0"	Feeble Current.
13	Mr. D. S. Kanitkar ..	Do. ..	Do. ..	4"	70'-0"	Do.
14	Mr. Krishnaji Laxman Pandit ..	Haveli ..	Ganeshkhind ..	4"	97'-0"	200 Gallons
15	Mr. B. A. Gann ..	Khed ..	Khed ..	4"	100'-0"	100 Gallons
16	Mr. Ganpatrao K. Borade ..	Do. ..	Shinoli ..	4"	105'-0"	No water
17	Mr. Manilal Chunilal Gujar ..	Do. ..	Do. ..	4"	125'-0"	125 Gallons
18	Mr. Mohanlal Jivanlal Gujar ..	Do. ..	Do. ..	4"	150'-0"	200 Gallons
19	Mr. V. N. Kulkarni ..	Do. ..	Khed ..	4"	57'-0"	....
20	The Agricultural Engineer ..	Haveli ..	Poona ..	4"	35'-0"	....
<i>Sholapur District</i>						
21	Mr. M. B. Kulkarni ..	Sholapur ..	Dongaon ..	3"	45'-0"	200 Gallons
22	Do. ..	Do. ..	Do. ..	4"	40'-0"	Do.
23	Do. ..	Do. ..	Do. ..	4"	50'-0"	Do.
24	Mr. Y. D. Khandekar ..	Do. ..	Do. ..	3"	45'-0"	Do.
25	Mr. N. S. Ambale ..	Do. ..	Do. ..	3"	50'-0"	Do.
26	Mr. S. D. Mete ..	Do. ..	Do. ..	4"	50'-0"	Do.
27	Mr. G. G. Patil ..	Do. ..	Do. ..	4"	50'-0"	Do.
28	Mr. D. V. Chafalkar ..	Do. ..	Kavathe ..	4"	45'-0"	Do.
29	Mr. D. S. Dargopatil ..	Do. ..	Sholapur ..	4"	70'-0"	Do.

taken during the year 1928-29

Well bore, or surface bore	Departmental charges	Labour charges	Cost of fuel lubricating oil, coal, etc.	Total cost of boring	Cost per foot	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Surface ..	NH	305 0 0	215 3 0	520 3 0	2 3 6	Completed this year, previous work done 85 feet.
Well ..	NH	94 0 0	92 4 0	186 4 0	2 2 3	Do. 39 feet.
Surface ..	NH	135 10 0	86 6 0	222 0 0	2 12 3	Do. 62 feet.
Well ..	NH	56 0 0	64 0 0	120 0 0	0 8 0	Do. 210 feet.
Surface ..	NH	81 15 0	95 9 0	177 3 0	2 6 0	
Do. ..	NH	150 4 0	203 5 0	353 9 0	1 11 9	
Do. ..	NH	119 0 0	100 5 0	219 5 0	3 2 3	
Do. ..	NH	115 0 0	97 6 0	212 6 0	3 1 6	
Do. ..	NH	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.
Do. ..	NH	140 4 0	106 2 0	246 6 0	3 14 6	Labour was very dear. The rock was very hard. Hence the cost per foot was very great.
Do. ..	NH	49 8 0	20 5 0	69 13 0	1 2 6	
Do. ..	NH	104 4 0	83 0 0	187 4 0	1 5 0	
Do. ..	NH	108 13 0	111 3 0	220 0 0	3 2 3	
Do. ..	120 8 0	55 0 0	65 3 0	241 0 0	2 8 0	
Do. ..	NH	97 8 0	177 3 0	275 0 0	2 12 0	
Do. ..	NH	75 0 0	125 2 0	200 2 0	1 0 9	
Do. ..	NH	52 8 0	132 11 0	185 3 0	1 7 0	
Do. ..	200 0 0	50 0 0	176 3 0	426 3 0	2 13 9	
Do. ..	..	..	..	..	..	In hand.
Do. ..	..	..	..	..	..	Do.
Surface ..	46 0 0	21 0 0	15 3 0	82 3	1 12 3	Completed this year, previous work done 12.6 feet.
Do. ..	40 0 0	36 4 0	23 14 0	100 2 0	2 3 0	
Do. ..	50 0 0	34 3 0	13 9 0	97 12 0	1 14 3	
Do. ..	45 8 0	23 0 0	15 3 0	84 0 0	1 12 6	
Do. ..	50 0 0	27 0 0	17 3 0	94 3 0	1 14 0	
Do. ..	50 0 0	18 0 0	16 3 0	84 3 0	1 11 0	
Do. ..	50 0 0	17 3 0	12 3 0	80 0 0	1 9 6	
Do. ..	48 0 0	30 0 0	36 6 0	114 6 0	2 7 6	
Do. ..	50 0 0	29 14 0	46 4 0	156 2 0	2 3 6	

Serial No.	Name of well Master	Taluka	Village	Diameter of Bore	Depth of Bore in feet	Water after Boring in gallon per hour
30	The Inspector of Agriculture.	Madha	Mohol	4"	74'-0"	200 Gallons
31	The Sub-Divisional Officer, P. W. D.	Do.	Do.	4"	77'-0"	Do.
32	Do.	Do.	Madha	4"	74'-0"	Do.
<i>Satara District</i>						
33	The Bombay Provincial Co-operative Bank, branch.	Valva	Islampur	4"	182'-0"	Feeble Current.
34	Mr. Bala Babaji Patil..	Do.	Do.	4"	102'-0"	50 Gallons
35	Mr. Sambhaji Abaji Patil.	Do.	Do.	4"	85'-0"	75 Gallons
36	Mr. Dharmaji Devaji ..	Do.	Do.	4"	48'-0"	No water
37	Mr. D. T. Khurd ..	Do.	Do.	4"	75'-0"	Do.
38	Mr. Dada Vishnudas Gujar.	Do.	Do.	4"	161'-0"	....
39	Mr. C. M. Gujar ..	Do.	Do.	4"	200'-0"	No water
40	Mr. Tatya Ramji Nalvade.	Satara	Vadha	4"	80'-0"	200 Gallons
41	Mr. R. T. Kahiragar ..	Do.	Fatkal	4"	65'-0"	Feeble Current.
42	Do.	Do.	Do.	4"	70'-0"	Do.
43	Mr. R. B. Mane ..	Do.	Do.	4"	77'-0"	Do.
44	Do.	Do.	Do.	4"	66'-0"	Do.
45	Mr. Kondiba Krishnaji.	Do.	Do.	4"	65'-0"	200 Gallons
46	Mr. Bajirao Doltrao Nalavade.	Do.	Do.	4"	84'-0"	Do.
47	Mr. Dnyanu Mahadu Patil.	Valva	Nava-Khed	4"	100'-0"	No water
48	Mr. D. R. Dalvi ..	Do.	Do.	4"	50'-0"	....
49	Miss Bhagirthibai Datto Yadav.	Satara	Khed	4"	120'-0"	No water
50	Do.	Do.	Do.	4"	105'-0"	....

Well bore or surface bore	Depart- mental charges	Labour charges	Cost of fuel- lubricat- ing oil, coal, etc.	Total cost of boring	Cost per foot	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Surface ..	86 0 0	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.
Do. ..	90 8 0	..	..	..	..	
Do. ..	..	..	..	..	..	
Surface ..	NH	214 0 0	186 13 8	400 13 8	2 4 8	In hand.
Do. ..	NH	55 0 0	105 0 0	160 0 0	1 9 0	The cost of transport cost much. Labour was very dear. The rock was very hard. Hence the cost per foot was very great.
Do. ..	NH	230 0 0	117 8 0	347 8 0	4 0 8	
Do. ..	NH	..	..	..	..	
Do. ..	NH	45 0 0	108 9 0	148 9 0	1 15 6	Failure as tool cannot work further.
Do. ..	NH	..	..	..	..	Not decided.
Do. ..	NH	129 6 0	181 0 0	310 6 0	1 9 3	Information regarding the labour charge, etc., is not yet received from the owner.
Do. ..	95 0 0	49 0 0	86 14 0	230 14 0	2 13 6	
Do. ..	NH	..	..	..	..	
Do. ..	NH	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.
Do. ..	NH	80 0 0	49 4 0	79 4 0	1 0 6	
Do. ..	NH	42 0 0	28 4 0	70 4 0	1 1 0	
Do. ..	72 8 0	20 0 0	24 8 0	117 0 0	1 13 0	Information regarding the labour charge, etc., is not yet received from the owner.
Do. ..	101 0 0	32 0 0	27 4 0	160 4 0	1 14 8	
Do. ..	NH	40 0 0	59 0 0	99 0 0	0 15 6	
Do. ..	..	..	..	..	..	In hand.
Do. ..	NH	50 0 0	70 0 0	120 0 0	1 0 0	In hand.
Do. ..	..	..	..	..	..	

Section IV-B

Engineering Advice and Assistance.—The Mechanical Assistant looked to Power Plants at Manjri, Loni, Kopergaon, Hanthurna, Mahegaon and Yeravandavana. Besides this, his services have been fully utilised in the year under report in the interest of cultivators and also the Department. As reported last year the response from the cultivators is now increasing and it can be seen from the work below :

(a) *Erection of new Plants and Machinery.*—(1) 11 B. H. P. Blackstone Spring Injection Cold Starting Engine with 45 Chattanooga Mill (Bawada-Indapur and Poona).

(2) 23 B. H. P. Blackstone Spring Injection Cold Starting Engine with 92 Chattanooga Mill (Belapur, Pravara Canals).

(3) 26 B. H. P. Blackstone Spring Injection Cold Starting Engine with 92 Chattanooga Mill (Lasurna, Baramati).

(4) 15 B. H. P. Blackstone Hot Start C. C. Type Crude Oil Engine (Kopergaon Farm) with 92 Chattanooga Mill.

(5) 6.5 B. H. P. Blackstone Standard Type with 44 Chattanooga Mill (Hanthurna for Power Crushing Society).

(6) 3" Centrifugal Pump on well (Bawada, Poona).

(7) No. 2½ Disintegrator (Carters' patent) for grinding Bone for manurial purpose (Baramati).

(8) Bran Juice Pump for Manjri Farm to be driven by underground gears.

In addition to this, in the Division, 2 new Power Cane Crushing Plants were erected by Cane-growers independently. With these the number of Power Crushers have come to 57.

(b) *Mechanical Advice.*—He visited 15 Crushing Plants and 7 Pumping Plants and rendered help in increasing the efficiency and advised in the erection of 10 Cotton-gins at Kopergaon.

He rendered help for correcting the foundations of Engines of cultivators installed at the following places by local Engineers :—

(1) 10-11 B. H. P. Ruston Hornsby Engine at Rahata (District Ahmednagar).

(2) 10 B. H. P. Blackstone "Hoppercooled" Engine, at Koregaon (District Satara).

(3) 10-11 B. H. P. Crossley Vertical Engine at Charegaon (District Satara).

He visited 28 wells and river-sites in Poona, Nagar and Satara Districts to give advice in the installation of Pumping Plants.

In addition to all this, he helped in the District Agricultural Show, Nagar, in erecting Pumping Plants and working tractors and prepared the following new improved designs :—

(1) Cane Juice Strainer, and

(2) Improved Hand-Cane mill.

He is studying the utility of Pumping Plants on Boat in Satara District.

Section IV-C

Pig-killing Campaigns.—The work is getting popular in the tracts where it has been demonstrated during the last 3 years and the cultivators have commenced to contribute their own subscription. The Mungi group collected from three villages Rs. 341 for this work and on similar lines Keregaon Group and Sinhagar groups are developing. The work done during the year is summarised below :—

Statement showing results of Anti-Pig Campaigns in South Central Division during 1928-29

Serial No.	Tracts worked	Period of campaigns	Pigs killed	Cost of the work	Cost per animal killed	Area of crop protected in Acres	Cost per acre protected	Remarks
1	2	3	4	5	6	7	8	9
				Rs. a.	Rs. a. p.		Rs. a. p.	
1	The North Keregaon group (30 villages).	June and July.	27 pigs 3 Panthers.	400	0 14 12 0	2,025 Acres Groundnut.	..	Poona party's work; cost high; as pig number met was very small.
						550 Acres Potato.	0 0 10	
2	Do.	August 25rd to January 7th.	25 pigs 15 bucks	200	0 5 0 0	10,000 Acres Babi Jowar.	per acre of 2 months watching season.	Poona Gunmen and beaters, village
3	Mungi Group (3 villages)	January to March	39 pigs 41 deer	341	0 4 4 2	5,000 Wheat and Gram and Babi Jowar.	0 1 2 per acre of 2 months watching season.	6 days' work of Poona Party; 15 days' work of 2 Poona gunmen; rest of the period work of 1 Poona gunman aided by 19 gunmen trained locally.
4	Sinhagar group (12 villages).	March to May end	50 pigs 1 Panther.	112	0 2 3 10	Demonstration work for formation of a bigger group.	..	Work of 2 gunmen and local beaters. These 2 gunmen are those sent outside for work in the Poona Party.
		Total	141 pigs 56 Deer 4 Panthers.	1,053	0 5 2 9	17,575 Acres of Crops.		

In this Division, no difficulties were experienced by cultivators in securing licenses for guns for crop protection.

Section IV-D

Field Embankments.—It has been realised that there is a great demand on the services of the Bunding Officer and cultivators have shown great keenness in knowing the right type of Bunding as they realise the benefits of the same in Famine Areas and many have lost thousands of

rupees in these works. The applications received included Tagai Loan Applications too, but it was thought that minor tagai loan applications which did not require technical advice could fairly be dealt with by the District Staff and hence these were transferred to different districts and the Bunding Officer was made to look to more Technical Schemes. The Bunding Officer dealt with the following applications during the year :—

Serial No.	District	Total No. of applications		Total No. of applications disposed off during the year		Remarks
		Revenue	Private	Revenue	Private	
(1)	Poona ..	66	17	38	7	
(2)	Sholapur ..	77	32	13	7	
(3)	Satara ..	22	3	11	1	
(4)	Nagar ..	92	14	5	5	

Besides, 159 minor Tagavi applications were transferred to the District Staff.

The applications disposed off included the following three types of works :—

(1) Tagai loan applications (received from Revenue Officers) above Rs. 500 which required advice after survey on the height of bund and proper position of waste-weir.

(2) Schemes from private individuals who wished for the proper alignment of Bund, position of Waste-weir and estimates.

(3) Private and joint schemes received from Credit Societies which were to be preliminarily surveyed from all its aspects.

Besides the disposal of the above schemes, the Bunding Officer had to organise Land Development Court at Nagar and Jalgaon (in N. C. Division) and render help in the conduction of the Land Development Class at Barsi.

In addition to his usual duties he has been asked to study the following problems side by side :—

(1) faults in schemes conducted by the cultivators on their own initiation in different tracts, and

(2) best practical methods of removing these, with less cost, in different tracts.

The material, when collected, is likely to serve as a useful literature in future.

Section IV-E

Presidency Agricultural Show, Ahmedabad.—During the year under report the work in connection with the Presidency Agricultural Show, Ahmedabad, was done by the staff on the same lines as was done towards the Presidency Agricultural Show at Poona held in 1926. I worked as a

Secretary of the Organization Court of the Show. The work in connection with the preparation of charts and maps was done by Mr. H. C. Patil, District Agricultural Overseer, Poona, in addition to his own duties. Demonstration of Sugar-making as a village industry was also arranged.

From this Division, six men were sent to work as demonstrators during the Show period. Besides these, two men were given to help the Pestology Court. From the four Districts, viz., Poona, Satara, Ahmednagar and Sholapur including Native States, 899 exhibits were placed at the Field Produce Section in the Show; and the list of prizes awarded is as under :—

Gold medals	..	..	..	2
Silver medals	..	..	..	3
Bronze medals	..	..	..	16
Cash prizes of different value	..	..	..	58

Section V

Agricultural Education.—The Royal Commission on Agriculture recommended abolition of schools of Loni Type on the grounds of high cost of expenses per boy. However, it was thought that experiment may be made by lowering the Scholarships in the 1st stage and secondly after some years allowing the boys at their own expenses to join the School. With this idea the amount of Scholarship paid to boys which was Rs. 10 per boy was reduced to Rs. 8 and Rs. 5 in the year. There were 93 applications, out of which 20 students were selected. But the number was as under in the 1st year :—

Rate of Scholarship.	No. of Students.
Rs. 8	7
Rs. 5	8

In addition to these, 3 paid students joined the school.

The following statement shows the results of the examination :—

Year	No. of boys	No. of boys appeared for examination	No. of boys passing the examination
1st year	18	16	15
2nd year	21	20	15

The expenses of the year amounted to Rs. 12,542-8-5 as against Rs. 15,232 and the receipts Rs. 1,862-0-3 against Rs. 1,373-0-0.

The boys had arranged to run their clubs. The expenses for meals came to Rs. 8-11-0 on an average. The management of boarding gives them tuition in marketing and organizing their own family affairs.

During the year 5 teachers were deputed by the Educational Department from East and West Khandesh, Ahmednagar and Nasik Districts and these were trained for Agricultural Bias Classes. Out of these 5, only 4 passed the examination.

In this Division there are 16 Agricultural Bias classes and every help was rendered to the Schools for arranging the cropping schemes, examining boys, etc., by the District Staff. As the number is increasing, the District Staff is required to spend unnecessarily more time by allowing their legitimate duties to suffer and some arrangement requires to be made by the District Local Boards.

Section VI

Co-ordination of Revenue, Irrigation and Agricultural Officers.—Hearty co-operation was received from both the departments without which the Shows and Demonstration work described above could not have been done. The second District Agricultural Show at Ahmednagar owes its credit to Mr. A. M. Macmillan, C.I.E., I.C.S., and the new mass propaganda scheme owes its originality and help from him. Similarly the excellent record of hire received from implements by Co-operative Implement Society amounting to Rs. 1,954 is due to the management by Mr. R. G. Gandhe, Mahalkari of Pathardi, who deserves a special credit. In the Frost work, the Canal and Sub-divisional Officers on the Godavari and the Pravara Canals rendered valuable services by their co-operation with the Agricultural Department in the propaganda conducted in that connection.

In addition to these, Khan Bahadur D. B. Cooper, President, District Local Board, Satara, continued his help to conduct the scheme of the District Local Board in regard to the agricultural propaganda in Satara District. Similarly, Mr. V. N. Kadhe, Vice-President, Taluka Development Association, Khed, deserves a special credit for helping the Agricultural Department and also conducting the work of the Taluka Development Association successfully since its auguration.

Divisional Boards of Agriculture.—From 1st November 1928 the Chairmanship of the Deccan Divisional Board was transferred to the Assistant Registrar, Co-operative Societies, Central Division, Poona, and the work done by the Board will be reported by that Officer.

Miscellaneous.—As mentioned in the last year's report the staff rendered services to the G. I. P. Railway for demonstrating Cinema Films at different stations in this Division. The staff of this Division has contributed their full quota in supplying material to local and principal newspapers, Shetaki and Shetakari and Agricultural College Magazine.

With the increased activities, the staff in this Division has tried to do their best with a very few exceptions. In the Mechanical and Boring Sections, Mr. Peter Rahatar and Mr. Govande have been rendering valuable services and amongst the two junior Graduates Mr. R. B. Ghatge has done exceptionally well. In the office section, Mr. P. T. Vishal, Head Clerk, has rendered great help and managed the work efficiently.

B. P. VAGHOLKAR,

Deputy Director of Agriculture,

S. C. D., Poona.

Poona, 24th July 1929.

APPENDIX E

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, SOUTHERN DIVISION, DHARWAR,
FOR THE YEAR 1928-29

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, throughout the year. Mr. Dharwarkar, Cotton Superintendent, S. M. C., was lent to the Hyderabad Government for five years from 16th August 1928 and Mr. Shevade, Superintendent, Dharwar Farm, was appointed to act for him from 1st October 1928. The Deputy Director held charge of the Cotton Superintendent also during the interval. From 1st October to 28th December, Mr. K. D. Gumaste, Graduate Assistant, Dharwar Farm, held charge of the office of the Superintendent and Mr. H. B. Kulkarni, District Agricultural Overseer, Gadag, was appointed to act in that place from 29th December 1928. Mr. V. S. Kulkarni, the Graduate Assistant lent to the District Agricultural Association, Dharwar, was transferred as District Agricultural Overseer, Gadag, and Mr. G. G. Hiremath, District Agricultural Overseer, Bailhongal, was lent to the Association. Mr. Itigi, who was lent to the Co-operative Department, reverted on 18th September 1928 and Mr. Kadkol, lent to the India Cotton Committee, reverted on 27th October 1928. Mr. Neginhal, District Agricultural Overseer, Chikodi, went on leave for a year from 4th October 1928 and Mr. A. N. Brahme, the Head Clerk of the Office of the Deputy Director of Agriculture, for eight months from 1st December 1928. One post of Graduate Assistant was transferred to the Agricultural College, as desired by the Director and this necessitated certain minor changes and transfers.

The organisation of the District staff brought about in the year 1923-24 still continued under which the Officers did both propaganda and organisation work.

Season

(2) With good ante-monsoon and early monsoon showers, preparatory tillage and sowing operations of kharif crops were satisfactory and the season opened with bright prospects. A long break in August and September, however, checked the growth of kharif crops and affected their yields to a certain extent. Groundnut in the transition tract and kharif jowar in the eastern dry tract suffered more than others. Kharif jowar suffered also from the attack of grass-hoppers. Heavy rains in November in the transition tract affected the harvest of groundnut crop. Unusual rains in the month of December followed by severe cold in January and continued easterly winds in February, considerably affected the growth of cotton but they were favourable to the growth of wheat and rabi jowar crops. Rains in March and April affected the quality of cotton to a great extent. There was good supply of water in wells all over the Division and garden crops thrived. The supply of fodder was adequate. The season under report was characterised by heavy rainfall and was, on the whole, better than that of last year.

(3) The work done by different sections is summarised under the same heads, as it was done in previous years to facilitate references and comparison, where needed, *viz.* :—

- (a) Research and experiments,
- (b) Propaganda,
- (c) Organisation,
- (d) Direct services to the public,
- (e) Agricultural education, and
- (f) General.

(a) *Research and Experiments*

(4) *Dharwar Farm.*—Plant breeding work on cotton, the chief money crop of the Division, continued to receive close attention. Dharwar No. 1 $\times$ Rosea Cross No. 15 gave higher yield than Dharwar No. 1. Strain No. 14 referred to last year was grown on a small scale, as the quantity of seed was limited and it has been sent for spinning test.

(5) Breeding wilt-resistant types of cotton also continued to receive much attention. The merit of Dharwar No. 1 $\times$ Dharwar No. 2 cross strain No. 1 was thoroughly tested on a number of wilt affected plots. The average number of wilt affected plants in the cross was 3.3 per cent. against 46.3 in Dharwar No. 1. The comparative yield in replicated plots was also higher than that of Kumpta and as good as that of Dharwar No. 2 cotton. This cross, therefore, is a wilt-resistant high yielding cotton as good as Dharwar No. 1 in quality and deserves to be introduced in the District in place of Dharwar No. 1 which is susceptible to wilt. It was grown during the year over the whole cotton-area of the Farm with good results. With Dharwar No. 1, the Farm continuously gave low yields and it was pleasing to note that the cross Dharwar No. 1 $\times$ Dharwar No. 2 presented wilt-free appearance and gave good yields.

Dharwar No. 1 $\times$ Wagale strain Nos. 4 and 6 referred to in the last year report were found pure and resisted wilt. They will be tested for yield during the coming season. The two crosses, *viz.*, Kumpta wilt-resistant $\times$ (Dharwar No. 1 $\times$ Rosea cross No. 15) and Dharwar No. 2 $\times$ (Dharwar No. 1 $\times$ Rosea cross No. 15) made with the object of introducing wilt-resistance in Dharwar No. 1 $\times$ Rosea cross, reached F4 generation during the year. They have yielded some promising strains which will be further tested.

With a view to find whether Dharwar No. 1 suffers more from wilt than local Kumpta, seed from different centres was obtained and grown side by side. Dharwar No. 1 suffered more than Dharwar, Hubli, Haveri and Bailhongal local cottons, but less than Gadag, Bijapur, Bagewadi and Bagalkot local cottons. As Dharwar No. 1 has been introduced on a very large scale in Hubli and Haveri centres and as it is risky to introduce a cotton more susceptible to wilt, it is decided to go ahead with Dharwar No. 1 $\times$ Dharwar No. 2 cotton, which is wilt-resistant.

(6) The crosses Dharwar No. 1 $\times$ Tashkant and Kumpta wilt-resistant $\times$ Tashkant made with the object of improving the staple, the cross

Dharwar No. 1 $\times$ Sangreim made with the object of improving the yield and the cross Dharwar No. 1 $\times$ Wagi made with the object of improving the ginning percentage, were under study in F₂ generation. The two new crosses (Dharwar No. 1 $\times$ Dharwar No. 2 strain No. 1) $\times$ Wagi and (Dharwar No. 1 $\times$ Rosea strain No. 15) $\times$ Wagi were studied in F₁ generation. All possible attempts are being made to combine high yield, high ginning percentage, good staple and wilt-resistance in Kumpta cotton.

(7) Selfing and multiplication of Dharwar No. 1, Gadag No. 1, Dharwar No. 1 $\times$ Dharwar No. 2 and Dharwar No. 1 $\times$ Rosea cottons continued. 60 lbs. of Dharwar No. 1, 30 lbs. of Gadag No. 1, 17 lbs. Dharwar No. 1 $\times$ Dharwar No. 2 and 16 lbs. of Dharwar No. 1 $\times$ Rosea seed have been produced by selfing which are sufficient for dibbling 20, 10, 5 and 6 acres, respectively.

Dharwar No. 1 $\times$ Dharwar No. 2 will continue to occupy the place of Dharwar No. 1 on the Farm and in the District; but until it is multiplied to a scale sufficient for 5,000 acres, Dharwar No. 1 will be continued. Dharwar No. 1 $\times$ Rosea and Gadag No. 1 will be multiplied on the Farm as usual in their second generation.

(8) *Other cotton breeding work.*—Selection of a strain in Kumpta cotton possessing all the three good characters (staple, ginning percentage and wilt-resistance) has not met with success. Two new varieties of cotton, one Gavarani from Nizam's Dominions and the other Millian Doller from Nanking (China) were tried and selection for staple was made in them. The study on correlation between ginning percentage and other economical characters was continued and an article is being written on the subject.

(9) *Selection in Dharwar-American cotton.*—Work on American cottons was transferred to the Cotton Mycologist; but in connection with correlation studies, Dharwar-American cotton is being grown on a small scale for the past three years. A few selections were made for earliness and resistance to red leaf blight. Selections made for earliness are not promising, as they possess short staple but one of the selections made for resistance to red leaf blight resisted it better than Gadag No. 1. Further attention will be given to this selection.

(10) Jowar breeding work was stopped according to the decision of the Research Committee meeting. Selected strains of Fulgar white, Fulgar yellow, Bilichagan, Nandyal and Savaner were, however, maintained, as there was some demand from the cultivators.

(11) In groundnut, two strains of Spanish peanut variety, Nos. 5 and 10-4, were compared. No. 10-4 gave more yield than No. 5.

(12) The other important experiments conducted on Dharwar Farm under the guidance of the Superintendent are summarised below :—

Crop experiments.—Five tobacco varieties, namely, Nipani, Nadiad No. 6, Pusa No. 28, Adcock and White Burlay, were tried during the year. Nipani and Nadiad No. 6 gave 796 lbs. and 708 lbs. yield per acre, respectively. The trial of these two promising varieties will be

repeated. The other three which have given very low yields, will be rejected. Tobacco crop again suffered from *Cercospora Nicotiana* disease and the quality of the crop produced suffered. The attention of the Plant Pathologist has been invited to this important matter and he has agreed to investigate it. If a remedy for this disease is found out, the prospects of tobacco crop in the black soil of the transition tract are very bright. The yields of jowar after tobacco (1,718 lbs. grain and 2,575 lbs. kadabi per acre) are also attractive, indicating the value of tobacco as a rotation to jowar crop. Three strains of Pivalya Kathya variety of wheat, Nos. 103, 162 and 224, were compared with local red wheat. All the three strains gave better results than the local and No. 103 stood first, giving 628 lbs. yield per acre. Safflower strain No. 7 from the Economic Botanist was compared with local but was found to yield less. The crop was attacked by Aphid. Five varieties of cotton, Dharwar No. 1, Dharwar No. 2, Kumpta Ordinary, Dharwar No. 1 $\times$ Dharwar No. 2 and Dharwar No. 1 $\times$ Rosea cross were compared. The yields obtained were 187 lbs., 308 lbs., 462 lbs., 429 lbs. and 240 lbs. per acre, respectively. The percentage of wilted plants was 33, 10.7, 12.6, 11.9 and 54.3, respectively. Results of Dharwar No. 1 $\times$ Dharwar No. 2 are striking. Three varieties of jowar, namely Bilichagan, Muddinandyal and Nandyal, were compared. Muddinandyal did better than the other two.

(13) *Manurial experiments*.—Results of experiments with different quantities of farmyard manure are in favour of 10 tons per acre to jowar crop in alternate years. Results of San green manuring experiments indicate that it is desirable to repeat San green manuring every fourth year. In artificial manure experiment on jowar, the application of sulphate of ammonia 14 lbs. nitrogen together with $2\frac{1}{2}$ tons farmyard manure has given the highest net profit, though it stood third in point of yield and the application of calcium cyanamide 14 lbs. nitrogen together with $2\frac{1}{2}$ tons farmyard manure, has given the highest yield, though it stood second in point of net profit. On cotton, artificial manures did not pay their extra costs.

(14) *Cultural experiments*.—In spacing experiment on cotton, 3 feet distance between rows has given better results than either 2 feet or 4 feet. During the year under report, two new rotation experiments were laid out. The ordinary rotation practised in the transition tract, where Dharwar Farm is situated, is kharif jowar and cotton. With a view to find out whether groundnut or tobacco forms better rotation to jowar, a two-year rotation experiment is laid out. Some intelligent cultivators who care to maintain the fertility of their fields, practise three-year rotation—jowar, cotton and wheat. With a view to find out whether tobacco or groundnut can replace wheat, a three-year rotation experiment is also laid out. Wheat is not a paying crop and the object of this experiment is to see whether tobacco and groundnut can replace wheat, without affecting the yields of jowar and cotton which follow. Results are recorded, and this being the first year of the experiment, they cannot be interpreted.

In the small garden on Dharwar Farm, figs and mangoes continued to receive attention. In all 277 mango grafts were prepared and sold during the year. Mr. Schutte's Drill and Kirloskar's portable power chaff-cutter were tried and further suggestions were made on the same.

(15) *Gokak Farm*.—Sugarcane continued to be the most paying crop on this Farm. H. M. 544 was observed to yield more than Yellow Mauritius. In seed-rate experiment on Yellow Mauritius variety, 15,000 sets per acre produced better results than either 10,000 or 12,000 sets per acre. Maize which is the principal crop in the Gokak Canal Tract continued to receive attention. Spacing experiment indicated that 18" distance between rows is better than 24" for maize. Selection in local maize was attempted during the year on the basis of weight of cob and proportion of grain to cob. Tobacco crop has not left any margin of profit. Five varieties were under trial and yields were below 700 lbs. per acre. Cotton and Rala continued to give better results than cotton alone.

(16) *Manurial Experiments*.—Farm yard manure (200 lbs. nitrogen) given in two dozes gave less yield than the ordinary method of giving it in one doze. In the quantitative manure experiment on maize the application of 5 tons of farm yard manure gave as good results as 7½ tons per acre, but the application of 10 tons reduced net profits.

(17) The Orchard and the nursery continued to work at a profit. Santra, Mosumbi and Limbu trees suffered from die-back disease. Pomegranates and mangoes thrived. The nursery branch was found more paying than the orchard itself. The total expenditure was Rs. 775 and receipts were Rs. 1,381 during the year, showing a net profit of Rs. 606.

(18) *Mugad Rice Breeding Station*.—Four promising strains of Mugad variety (Early No. 161, Inter Nos. 81 and 249 and Late No. 200) and three of Antersal (Early No. 67, Inter No. 90 and Late No. 200) were tested again during the year in replicated plots and were found to be more yielding than local. These will be maintained. Tests in cultivators' fields also have been very encouraging. Regular multiplication work will be organised during the coming season. Study on the cross between Mugad No. 81 × Kolamba 39 continued on 141 individual plants in F4 generation. Almost all of them were found to be splitting. In all 100 individual selections have been made this year which will be further tested for purity and economic characters. Five of these seem to be more promising. Botanical study on Gonag also continued.

(19) *Tegur Cattle Breeding Farm*.—The progeny of the cross between local cows and Amrit Mahal Bull, in the third generation, continued to show great improvement. The work of the Tegur Farm has now attracted the attention of cultivators from all over the transition tract. The bull calves sold up till now in various places have created good

impressions on their minds. Thirteen bull calves and 8 cow calves were born during the year. The total number of the herd on 31st March 1929 was 120, valued at Rs. 6,471, against 128, valued at Rs. 6,727, last year. Results of crossing local sheep with Merino Ram have also been encouraging. Improvement in the quality of wool is considerable. The total expenditure of the farm including the pay of the monthly men and repairs to buildings came to Rs. 2,988 and receipts Rs. 1,050. Hay and silage of grass were prepared and fodder crops suitable to the conditions of rainfall were grown on the Farm itself. Very little concentrated feed was purchased from outside.

(20) *Experiments in cultivators' fields.*—The District staff undertook trials of improved strains of crops and manures in cultivators' fields as usual. Dharwar No. 1 and Dharwar No. 1 × Dharwar No. 2 cottons were compared with local Kumpta at Amergol and Sharewad. Results on the whole were in favour of Dharwar No. 1 × Dharwar No. 2. Gadag No. 1 was compared with local Dharwar-American cotton at Ron and the results were in favour of the former. The superiority of Gadag No. 1 cotton was brought to the notice of the cultivators by holding a special demonstration. The cotton varietal experiment conducted at Bailhongal was in favour of local Kumpta. Dhulia No. 1 was compared with N. R. under well-irrigation at Indi. N. R. gave more yield than Dhulia No. 1. Among the trials of selected strains of paddy Mugad No. 249, Mugad No. 161, Mugad No. 141, Antersal No. 200 and Antersal No. 67 did better than local checks in various places of Mundgod Division. Mugad No. 249, Mugad No. 161, and Antersal No. 200 did better than local in Dharwar Division. Mugad No. 249, Mugad No. 161 and Mugad No. 81 were found better than local in Haveri Division and Mugad No. 246 and Antersal No. 67 in Belgaum Division. Among the trials of jowar strains Muddinandyal was appreciated at Dharwar, Bilichagan at Haveri and Savaner at Gadag. Nadiad tobacco did better than local at Nipani and Dharwar. Seed rate experiment with groundnut at Haveri and Gadag have taught the cultivators to sow Spanish peanut variety of groundnut at 60 to 80 lbs. per acre in preference to their local seed rate at 40 lbs. Results of night soil on chilly crop at Bijapur continued to be better than those with farm yard manure. Results of sulphate of ammonia on jowar and cotton were better than those of farm yard manure and groundnut cake at Dharwar and Bailhongal. Dry farming experiments conducted at Bijapur and Bagewadi need repetition, as the year under report was one of an unusually heavy rainfall.

(b) *Propaganda*

(21) *District Cotton Work.*—Multiplication and distribution of Dharwar No. 1, Gadag No. 1 and Dharwar No. 1 × Rosea cross cotton seeds continued round Hubli, Gadag and Bailhongal, respectively. Seed of 3rd, 4th, and 5th generation was sown in the reserved areas and the crop was inspected from time to time and rouged. The produce was collected and ginned separately and the seed obtained was stocked for distribution

during the coming year. The quantity of work done is summarised in the following statement :—

Name of variety	Generation	Quantity of seed distributed in lbs.	Area sown in acres	Quantity of produce in dokras	Quantity stocked for distribution in 1929-30
Dharwar No. 1	III	1,950	217	129	36,218
Do.	IV	38,938	4,394	1,525	4,14,400
Do.	V	18,320	1,555	100	20,160
Gadag No. 1	III	868	107	60	10,000
Do.	IV	10,407	1,108	108	25,106
Do.	V	1,03,234	11,125	1,115	2,62,348
Dharwar No. 1	III	391	56	38	7,176
Do.	IV	1,306	180	70	12,180
Rosea	V	40,406	5,718	407	85,280

Owing to the unfavourable season, the yields especially of Gadag No. 1 cotton were far less than normal. Damage done by late rains was also considerable. To add to this, only 54 per cent. of the cultivators from the Hubli reserved area brought their cotton to the Sale Society. The seed stocked from the reserved area for general distribution, therefore, considerably fell during the year. To make it up, however, to a certain extent, Hubli Society purchased 1,61,000 lbs. Dharwar No. 1 and Gadag Society 1,93,220 lbs. Gadag No. 1 seed from high class lots of general crop.

(22) As usual the distribution of seed up to the 5th generation in a limited area where roguing was necessary, was under the direct control of the Cotton Staff. For distribution of general seed stocked by the Cotton Sale Societies in the 6th generation the Officers of the Agricultural Department and Cotton Sale Societies continued to work together by opening depôts in different centres. Sardar Mahabooba Allikhan of Hubli and Gadag Dalals' Association also distributed some quantities of Dharwar No. 1 and Gadag No. 1 cotton seeds, respectively, which they had stocked last year from the general crop which they received in the market. Dharwar No. 1 × Rosea cross cotton seed was mainly distributed by the Bailhongal Cotton Sale Society. The estimated area in acres sown during the year with these three cottons through different agencies is tabulated below :—

Name of variety	Area controlled by the cotton staff directly (5th generation)	Area sown with general seed stocked by the Societies (6th generation)	Area sown with seed stocked by other agencies. (Unknown generation)	Total
	Acres	Acres	Acres	Acres
Dharwar No. 1	6,900	70,610	12,500	90,010
Gadag No. 1	12,340	64,556	62,500	1,39,396
Dharwar No. 1 × Rosea.	237	5,718	....	5,955
	19,477	1,40,884	75,000	2 35,361

As foretold in paragraph (21) of the last year's report the area under Dharwar No. 1 cotton from the pedigree seed contracted considerably during the year. It was only 90,010 acres against 1,77,800 acres last year. Spread of Dharwar No. 1 and Gadag No. 1 cottons round Bijapur and Bagalkot continues to be very limited.

(23) *Grading and Auction Sales.*—In all 4,489 dokras of Dharwar No. 1 cotton in Hubli and Haveri Cotton Sale Societies and 11,149 dokras of Gadag No. 1 Cotton in Gadag Cotton Sale Society were graded against 1,821 and 9,744, respectively, last year. The Hubli Cotton Sale Society sold 83 per cent. of its stock by private treaty and Gadag 56 per cent. At Bailhongal 2,081 dokras of Dharwar No. 1 × Rosea cross were graded and most of it was sold by auction.

(24) *Working of the Cotton Transport Act.*—Nine hundred and seventeen licenses were issued from Gadag office to import 24,667 dokras of cotton from the adjoining villages of Nizam's Dominions and Madras Presidency and 251 licenses were issued from Bagalkot office to import 6,669 dokras of cotton from river side villages of Bijapur area. The import of fly was altogether stopped by rail. In order to stop import by road 8 check stations referred to in the last year's report were established during the year. The Cotton Transport Act continued to work well in the interest of the grower and the consumer of Kumpta and Dharwar-American cottons. Two complaints were lodged against four persons who imported cotton in Bagalkot area without licenses and the accused were fined Rs. 40 each by the First Class Magistrate of Bagalkot. The accused have applied for revision and the Sessions Judge of Bijapur has referred the matter to the High Court with his recommendation for acquittal. I am arranging to instruct the Government Pleader in Bombay to oppose the recommendation of the Sessions Judge and argue the Departmental test cases. As import of fly and inferior cotton is stopped, middle-men are mixing Kumpta and Dharwar-American cottons more freely and have taken to the malpractice of watering cotton and leaving crushed seed in lint. It is desirable that these malpractices should also be stopped.

(25) *General District Work.*—The District Agricultural Overseers as usual, held numerous demonstrations of improved implements such as iron ploughs, wheat threshers, chaff-cutters, iron scraper, stone roller for threshing jowar, and improved sugarcane mill in their jurisdictions. Forty-eight of these are reported to have produced very good results. The demonstrations of wheat-thresher in Gadag Division and those of iron ploughs in Bijapur District were very successful with a result that a number of these implements have been purchased by cultivators. Demonstrations of tractor ploughing continued under the auspices of Dharwar District Agricultural Association and Bijapur Wilson Anti-Famine Institute. Groundnut-seed-drill attracted the attention of the cultivators in Mundargi Petha. Wire fencing demonstration held in five places of Dharwar and Mundgod Divisions has created a liking for it. Demonstrations of field embankments were conducted in five places with very good results. Tin sheet operations against the attack of grasshoppers were

demonstrated all over the Division and 24 of them were on a large scale. Campaigns against this pest on co-operative basis were organised in two places with Government aid and in three other places without it. Tin sheet operations against grasshoppers were effective everywhere and cultivators have appreciated them very much. The Deputy Director arranged to issue instructions on "Ten main points of conducting tin sheet operations" under different conditions.

(26) Agricultural and Cattle shows were held at Savadi, Ron, Devargudda, Hosritti and Kittur in the Dharwar District, Bijapur, Kanmadi, Badami, Sangam and Bantnal in the Bijapur District and Kokatnur and Athani in the Belgaum District. Most of these are places where annual cattle fairs are held and it was very pleasing to observe that the local committees took great interest in organising the shows as required by the Agricultural Department and distributed prizes to good cattle. During these shows and in six Training Classes held in the Division, lectures on agricultural improvements were delivered and public attention was drawn to the question of direct utility to the tracts. Demonstrations and lectures were also arranged in 13 Revenue Jamabandi meetings of village officers. The Deputy Collectors took keen interest in organising these meetings. An Agricultural and Co-operative Conference was held at Badami, and it was presided over by the Deputy Director. A very interesting museum and Agricultural Show were arranged at the time of the opening ceremony of the Wilson Anti-Famine Institute Building at Bijapur. The museum was organised inside and the Show outside the building. This show was the first of its kind in Bijapur District and resembled the Provincial Show on a small scale. The Deputy Director, the Cotton Superintendent and the District staff of the Bijapur District worked continuously for a fortnight for this show. Museum and Show guides were published for use to the public. The Show was opened by the Commissioner, Southern Division and continued for three days. The attendance was very great.

(27) *Propaganda against Smut on Jowar*.—This work was continued mainly through Revenue Officers. The District staff conducted a number of demonstrations in co-operation with the Mamlatdars at important centres. In all 29,398 packets were distributed (5,337 in Belgaum District, 11,306 in Dharwar District, and 12,755 in Bijapur District). This was sufficient, on an average, to treat seed for about 117,592 acres. Besides this, dusting jowar seed in sulphur dust against smut was experimented in various centres of the Division, and it is found as efficacious as steeping jowar seed in copper sulphate solution and more easy to practise. The Collector of Bijapur distributed 3,811 lbs. of sulphur dust in his District, through the Wilson Anti-Famine Institute. Attempts will be made to make it more popular even in Dharwar and Belgaum Districts, during the coming season.

(28) Interesting articles were published in the Kanarese Agricultural Magazine from time to time. The articles on sulphur dusting against smut and grasshoppers campaigns were very useful to the cultivators.

Departmental leaflets were distributed in all demonstrations and meetings. Correspondence with individual cultivators also considerably increased in volume.

Organisation

(29) Seed, implement and manure Societies did not show much progress. Those at Devi-hosur and Hulkoti continued to do better than others. I am of opinion that Credit Societies should be made to take indents from their members and Taluka Development Associations should be asked to obtain and supply the necessary seed, implement and manures. There seem to be no need for separate small societies for the purpose.

(30) The Co-operative Cotton Sale Societies at Hubli, Gadag and Bailhongal continued to do good work. They seem to have reached a limit, however, which they cannot cross. It is worth investigating why they are not able to increase their work and see whether they can be helped. Those at Haveri, Bijapur and Bagalkot are not making good progress. Bagalkot Sale Society did very little. The progress of various Societies is tabulated below :—

Name of society	Number of members	Share capital	Number of dokras sold			Value of cotton
			By auction	By private treaty	Total	
		Rs.				Rs.
Hubli	2,585	17,295	2,475	13,872	15,847	8,06,500
Gadag	1,005	41,225	5,228	6,801	12,029	6,13,153
Haveri	677	7,160	819	442	1,261	60,693
Bailhongal ..	288	4,090	2,583	3,875	6,458	2,89,432
Bijapur	173	2,720	300	1,718	2,018	87,323

(31) The Nipani Tobacco Sale Society and Sankeshwar General Sale Society are making fair progress. The Byadgi Chilly Sale Society did well during the year. It sold 423,780 lbs. dry chillies worth Rs. 39,640 against the quantity worth Rs. 18,710 last year and realised a net profit of Rs. 705. It is attempting to introduce a system of auction sale.

(32) The Cattle Breeding Societies are realising the benefits ; but progress achieved on the whole is yet very limited. Sidenur Cattle Breeding Society continued to do good work whereas others only fair.

(33) *Fencing Societies.*—Benefits of fencing against wild pigs have been appreciated by the cultivators all over the Mallad tract, but joint action which is necessary has become difficult to be achieved. Some absentee landlords refuse to pay their subscriptions and schemes undertaken do not mature soon. A legislation to coerce minority is absolutely needed for further progress. If 75 per cent. land-owners agree to a scheme, the other 25 per cent. should be compelled to join by law. The Arbhavi Fencing Scheme which was nearly mature is still taking its

time. Schemes in Mundargi Petha are not at all developing. Those at Tadas and Kadankop are still pending. Cultivators of many villages in Mallad are approaching for new schemes, but it has not been possible to undertake them as some absentee landlords come in the way. The old fencing societies in Kalghatgi Taluka continued to realise the benefits of their stone walls. The ten miles wire fence ordered during last year was all distributed. Most of it was purchased by individual cultivators and Departmental help was given to erect it round their fields. Another ten miles fence will be ordered during the coming season.

(34) Campaigns for the removal of the prickly-pear, a shelter to wild pigs, continued in the Mundargi Petha of Dharwar District. In all prickly-pear standing on 125 acres of Government waste land and nearly 116 acres private waste lands, has been removed. The total tagai loan so far taken, amounted to Rs. 14,400 of which Rs. 8,330 have already been returned by the cultivators. The total area, estimated to be protected in the six groups of villages where operations are in progress, comes to 46,000 acres and benefits to be derived by the cultivators are immense. This work has been much appreciated by the people of Mundargi Petha.

(35) In order to protect the crops against wild deer which have become a pest in the Ron Taluka, campaigns were organised in three villages. Local license holders guided by a few trained sikaries hired from the neighbouring Badami Taluka on payment, conducted these campaigns. They took a round along the borders of the village area every day and the deer found were either shot or scared away. In all about 200 deer were killed and many more were scared away. Local Village Committees were organised to collect funds for the purpose.

(36) Joint Cultivation Societies at Yelvigi and Maharajpeth referred to paragraph 36 of the last year's report continued their work. They require close guidance which is still wanting.

(37) *Taluka Development Associations.*—Twelve Taluka Development Associations continued to work during the year. Two new associations are being attempted, one at Mundargi and the other at Halyal. No new association will be started until the financial strength is secured. All Associations conducted demonstrations of improved implements and selected strains of crops introduced by the Agricultural Department. They also demonstrated steeping jowar seed in copper sulphate solution against smut. Other important works done by them are as follows:—

The Gadag Association helped the Cotton Sale Society in organising its reserved area and distributing Gadag No. 1 cotton seed. The Haveri Association distributed 122 bags of fertilisers and Chikodi Association 40 tons of Sulphate of Ammonia. Hangal and Gokak Taluka Development Associations interested themselves in solving the difficulties of the cultivators in the Canal areas. Bijapur Association distributed 150 cartloads of night soil and induced the cultivators to make use of it. The Indi Association did propaganda for extension of fruit cultivation.

Murgod Mahal Association did very good work in grasshopper campaign. The total amount of subsidy given to these Associations amounts to Rs. 7,291.

(38) The Dharwar District Agricultural Association sold implements worth Rs. 924 and realised a net profit of Rs. 77. The hire proceeds of iron ploughs were only Rs. 62 against Rs. 117 last year. The sale of 1,800 mango grafts brought in Rs. 208 net profit. Income from other sources was very limited. The tractor owned by the Association ploughed only 90 acres during the year and there was loss in the transaction. The area to be ploughed was canvassed but the machine went out of order. The Association has incurred debt and its expenditure has outgrown its income. A new Departmental hand is lent to the Association recently and he is trying to improve the situation.

(39) The Divisional Board of Agriculture held its quarterly meetings regularly and guided the work of the Taluka Development Associations and the District staff of the Agricultural and the Co-operative Departments. Rao Sahab V. V. Shirgaonkar took keen interest in its deliberations. Mr. S. K. Hosmani tendered his resignation during the year.

Direct Services to the Public

(40) *Field Embankments*.—One Bunding Officer continued to work in Bijapur District and the other in Dharwar and Belgaum Districts. District Agricultural Overseers, Bijapur, Bagewadi and Bagalkot, also inspected and guided bunding works. In Bijapur District, bunding work is making good progress and is much appreciated by the cultivators. Plans and estimates were prepared for 32 schemes in 21 villages. Traced copies of 27 schemes were supplied to cultivators through the Collector. The estimated cost of 32 schemes was Rs. 45,144. In addition to these, 22 schemes for reclamation of small nalla beds were prepared. Besides preparing these 54 fresh schemes in all, 54 old executed works were inspected during the year and advice where necessary was given to the cultivators over repairs. In Belgaum and Dharwar Districts, 24 small schemes for 29 survey numbers (440 acres) were prepared. The estimated cost of these was Rs. 7,700. Tallur Joint Scheme was inspected after heavy rains and was observed to have been much appreciated by the cultivators. Two experiments on "Broad based low bunds" were laid out at Annigeri and Bhadrapur in Dharwar District in deep black soil where bunding is a difficult problem. The Bunding Officer, Dharwar, was deputed to Barsi for helping the Deputy Director of Agriculture, S. C. D., in conducting Land Development Class. He was also sent to Nasik for a month under the orders of the Director of Agriculture to lay out some model bunds in that tract. During this period he trained Mr. Purandhare, the new Bunding Officer, N. C. D. The Bunding Officer, Bijapur, trained special Tagai and Revenue staff to prepare small schemes. A few interesting models and charts were prepared and placed in the museum of the Wilson Anti-Famine Institution, Bijapur. Appreciation and demand for Departmental service in bunding has very much increased but the staff is too limited to meet it.

(41) *Boring*.—The two machines lent to the Belgaum District Local Board were taken back. In all 24 bores were taken and the total depth bored was 2,285 feet against 2,159 feet last year. Of these, 17 were surface bores and 7 in existing wells. Out of 17 surface bores, 15 were successful and two failed. Out of seven well bores, two were successful and five failed. The details of each bore are given in appendix A.

(42) In addition to the actual boring work mentioned above, 15 pumps were fitted on successful bores and four old pumps were repaired. New 2-inch counter shafts were fitted to machine No. 7 and 22 in place of old 1½-inch shafts. New iron clamps of wheel type for turning rope were designed and supplied to all machines. These clamps are more convenient than ordinary wooden clamps. A new sand pump valve and rope-guide brackets have been designed and they are working very satisfactorily.

(43) *Work of the Mechanical Assistant*.—He overhauled the machinery on different farms of the Division and attended to repairs when required. He inspected sites and prepared plans and estimates for 16 pumping plants (6 in Dharwar, 4 in Belgaum and 6 in Bijapur District)—Ten of these for wells and six for rivers. He erected two pumping plants, one at Yerdal in Sampgaon Taluka of the Belgaum District and the other at Bijapur, both on wells. Machinery for three plants has arrived. He attended to the work of overhauling tractors at Dharwar and Bijapur. The Deputy Director and the Mechanical Assistant gave considerable thought over suitable power chaff cutters and bullock gear water-lifts.

(44) *Karjagi Fodder Storage*.—Necessary repairs were made to the fodder stacks at Karjagi and they were re-insured against fire. Under Government orders, the sale of 3-year old fodder has been advertised through Kanarese Agricultural Magazine, Local Newspapers and through Revenue Officers. Demand is awaited.

(45) *Tagai Loan Applications*.—Besides those for bunding in Bijapur District referred to in paragraph 40 amounting to Rs. 45,144, tagai loan applications amounting to Rs. 61,265 for various land improvement schemes received through Co-operative Societies and Revenue Officers were dealt with in Dharwar and Belgaum Districts, against those amounting to Rs. 52,050 last year. This work is also much increasing.

Agricultural Education

(46) The Vernacular Agricultural School at Devi-hosur completed its 15th year and during this period 172 students have passed out. 12 students in the first year and 14 students in the second year and three Vernacular Teachers for Agricultural Bias Classes, received education during the year. Results of the annual examination were good. It is creditable that Mr. Pavate, the Head Master of the School, manages to train both students and teachers without any graduate assistant under him. This no doubt means considerable strain to him but it has not yet been possible to give a graduate assistant to the school after Mr. Hulkoti, the previous Head Master, left it. It is gratifying to note that 93 past students of this school have taken to private farming. The District staff has

been instructed to guide their work. The Agricultural bias classes are becoming popular and demand for these is increasing. Examinations of all these 21 Agricultural Bias Classes in the Division were conducted by the District staff of the Agricultural Department. This is an additional work to the District staff and it is very much increasing. Training given to the teachers in Devi-hosur school is not enough. A separate Vernacular College for training teachers for Agricultural Bias classes has become an urgent need.

(47) *Publications*.—One leaflet No. 16 of 1928 was published on the "Use of poudrette and town sweepings as manures to dry crops (jowar and cotton) in the transition tract of Karnatak." Kanarese versions of leaflet No. 2 of 1929 on "Prickly-pear as fodder," of leaflet No. 3 of 1929 on "Sugarcane crushing," and of a note on "Improvements of primary cotton marketing," were made. Information for revising the leaflet No. 3 of 1914 on "Manure for potatoes" was also supplied. A bulletin on "Bunding," a note on "Reclamation of alkali lands" and revision of some old leaflets are on hand. A note on the work of removing prickly-pear against wild pigs in Mundargi Petha was prepared and a bulletin on the same is under consideration.

(48) Other important works done during the year were as follow :—

(1) The proposed Aigali, Shivayogmandir and Herkal Irrigation schemes prepared by the Superintending Engineer, Minor Irrigation Works, were inspected and reports submitted thereon.

(2) The Crop Cutting Experiments were conducted all over the Division.

(3) Two silo pits were built for demonstration in the Gokak Canal Tract.

(4) 637 exhibits were sent to Ahmedabad Show.

The Deputy Director attended the Research Committee meeting at Poona, Provincial Co-operative Conference in Bombay and Provincial Agricultural Show at Ahmedabad. The Divisional Conference of the Officers of the Agricultural Department in the Southern Division was held as usual during the year.

General

(49) The work of the Agricultural Department in the Southern Division especially in the direction of bunding, fencing and spread of improved strains of cotton, groundnut and paddy crops, is much appreciated by the cultivators and is fast extending. I must reiterate therefore that the staff needs strengthening with more funds for travelling.

(50) All members of the staff with a few exceptions did their duties well. In the absence of Mr. Brahme, the acting Head Clerk Mr. Onkar ably conducted the increasing work of my office with the aid of other clerks. The organising capacity of the District staff is still required to be raised which I am attempting. Good many Revenue Officers and private gentlemen continued to help our propaganda and organisation work and my thanks are due to them all. The Mahalkari of Mundargi rendered very valuable assistance in organising campaigns to eradicate

prickly-pear against wild pigs. The activities of Mr. Naik, the Collector and Mr. Hiremath, the District Deputy Collector, Bijapur, were too many to be described.

(51) The Honourable Mr. Jadhav, Minister for Agriculture, visited this Division in November 1928. He inspected Dharwar and Tegur Farms and expressed his appreciation of work that is being conducted there. He also inspected co-operative institutions and Rao Saheb Shirgaonkar's farm at Benkanhalli near Belgaum and enquired into the needs of the people. His visit was a very social one and he made himself approachable to all.

S. S. SALIMATH,
Deputy Director of Agriculture,
Southern Division, Dharwar

Statement showing particulars of Boring work in

Serial No.	Name of owner	Taluka	Village
1	Savanur State work	Bankapur	Hullkatti
2	Do.	Do.	Torur
3	Municipality Halyal, No. 1		Halyal
4	Do. No. 2		Do.
5	Do. No. 3		Do.
6	Rao Bahadur Shetty, No. 1, ...	Havari	Devihosur
7	Mr. Chidambhar S. Kulkarni	Do.	Do.
8	Rao Bahadur Shetty, No. 2	Do.	Do.
9	Mr. K. G. Kulkarni, No. 1	Bankapur	Taralhatti
10	Do. No. 2	Do.	Do.
11	Mr. N. V. Hullgol	Sadag	Kulsapur
12	Do.	Do.	Do.
13	Police Lines	Navalgund	Nargund
14	Do.	Roh	Gajendragad
15	District Local Board, Belgaum	Athani	Chikud
16	Do. do.	Do.	Do.
17	Mr. Balappa S. Katti	Do.	Do.
18	Mr. Pandurang H. Mirajakar	Chikodi	Nipani
19	Mr. Gopal B. Mirajakar	Do.	Do.
20	Mr. Lilachand Gujar	Do.	Do.
21	Shrimant Khanderao Sholapurkar	Do.	Do.
22	Taluka Local Board, Gokak	Gokak	Tavag
23	Mr. V. G. Joshi	Do.	Gokak
24	Mr. Raghunath Set	Do.	Do.

Southern Division during the year 1928-29

Date of starting	Date of completing	Depth bored in feet	Size of bore	Water before boring	Water after boring
10th July 1928 ..	30th August 1928 ..	150'	4"	Surface ..	250
10th September 1928	22nd November 1928	150'	4"	Do. ..	250
26th January 1929 ..	21st March 1929 ..	82'-3"	4"	Do. ..	250
27th March 1929 ..	9th May 1929 ..	63'	4"	Do. ..	250
20th May 1928 ..		In progress.			
11th May 1928 ..	9th August 1928 ..	41'-8"	4"	Well ..	250
14th September 1928	22nd November 1928	107'	4"	Surface ..	250
3rd December 1928	29th January 1929 ..	38'-4"	4"	Well ..	40
22nd April 1929 ..	14th May 1929 ..	100'	4"	Surface ..	250
26th May 1929 ..		In progress.			
12th July 1928 ..	28th July 1928 ..	43'	4"	Surface ..	Fail.
2nd August 1928 ..	30th September 1928	200'	4"	Do. ..	250
15th November 1928	20th February 1929	185'-6"	4"	Do. ..	200
7th March 1929 ..	23rd June 1929 ..	150'	4"	Do. ..	250
14th September 1928	2nd November 1928	153'	4"	Do. ..	40
7th November 1928	14th December 1928	132'	4"	..	300
17th December 1928	31st December 1928	60'	4"	..	300
11th January 1929 ..	23rd March 1929 ..	107'	4"	..	30
6th April 1929 ..	15th April 1929 ..	38'	4"	..	300
21st April 1929 ..	2nd May 1929 ..	50'	4"	..	300
18th May 1929 ..	12th June 1929 ..	90'	4"	Well ..	Fail.
15th September 1928	31st October 1928 ..	65'	4"	Do. ..	200
10th November 1928	28th January 1929 ..	114'	4"	Surface ..	250
5th February 1929 ..	22nd May 1929 ..	110' 10"	4"	Well ..	Fail.

Statement showing particulars of Boring work in

Serial No.	Name of owner	Departmental charges			Charges for coolies, cartage, etc.		
		Rs.	a.	p.	Rs.	a.	p.
1	Savanur State work	200	0	0	137	8	0
2	Do.	200	0	0	200	0	0
3	Municipality Halyal, No. 1	98	6	0	121	12	0
4	Do. No. 2	69	8	0	111	8	0
5	Do. No. 3						
6	Rao Bahadur Shetty, No. 1	55	1	0	74	10	0
7	Mr. Chidambar S. Kulkarni	135	8	0	68	14	0
8	Rao Bahadur Shetty, No. 2 .. ..	....			114	8	0
9	Mr. K. G. Kulkarni, No. 1.. ..	125	0	0	137	0	0
10	Do. No. 2						In
11	Mr. N. V. Hulgol	43	0	0	18	6	0
12	Do.	275	0	0	106	4	0
13	Police Lines	178	4	0			
14	Do.	200	0	0			
15	District Local Board, Belgaum	204	8	0			
16	Do. do.	173	0	0			
17	Mr. Balappa S. Katti	65	0	0	18	12	0
18	Mr. Pandurang H. Mirajakar .. ..	....			70	0	0
19	Mr. Gopal B. Mirajakar	39	0	0	18	0	0
20	Mr. Lalachand Gujar	50	0	0	22	8	0
21	Shrimant Khanderao Sholapurkar .. ..	....			55	0	0
22	Taluka Local Board, Gokak	57	8	0	219	0	0
23	Mr. V. G. Joshi	96	8	0	103	11	0
24	Mr. Raghunath Set .. ..	....			206	0	0

Southern Division during the year 1928-29—contd.

Cost of fuel, oil, etc.	Cost of casing pipe	Total cost of bore	Cost per foot	Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
106 4 0	62 8 0	506 4 0	3 6 0	Successful.
160 9 0	75 0 0	635 9 0	4 4 0	Do.
83 2 0	74 15 0	378 13 0	4 9 6	Do.
74 10 0	NH	255 19 0	3 9 3	Do.
progress.				
75 14 0	Included in bill.	205 9 0	4 15 0	Successful.
97 0 0	NH	301 6 0	2 13 0	
125 14 0	NH	233 6 0	6 3 6	Fail.
44 8 0	110 7 0	418 13 0	4 3 0	
progress.				
33 10 0	NH	95 0 0	2 3 3	
77 0 0	33 0 0	496 4 0	2 8 0	Successful.
	Information not received.			Do.
	Do.			Do.
	Do.			Fail.
	Do.			Successful.
23 3 0	....	121 15 0	1 14 8	Do.
71 1 0	....	141 1 0	1 5 0	Fail.
19 4 9	....	76 4 9	1 15 3	Successful.
23 10 0	....	96 2 0	1 14 0	Do.
65 5 0	100 0 0	220 5 0	2 7 6	Fail.
59 2 0	3 12 0	339 5 0	5 3 6	Successful.
94 2 0	75 0 0	369 5 0	3 3 9	Do.
154 2 0	NH	360 2 0	3 4 0	Fail.

APPENDIX F

SUMMARY OF WORK DONE BY THE DEPUTY DIRECTOR OF
AGRICULTURE, GUJARAT, SURAT, FOR THE YEAR 1928-29

I.—Staff

The most important change was the retirement of Rao Saheb (now Rao Bahadur) Bhimbhai M. Desai from the Deputy Director's post in this Division from 1st January 1929 when I succeeded him. Rao Bahadur Bhimbhai was one of the oldest Officers of the Bombay Department of Agriculture. He joined the Department in 1896 as a Clerk on Surat Farm and rose to the high position of the Deputy Director of Agriculture by dint of high capacity and hard work. He was associated with almost all the phases of work in this Division in various capacities and his long term of 33 years' service ending in his work as General Secretary of the Presidency Agricultural Show, Ahmedabad, held in November 1928 has happily terminated in high appreciation of his work.

2. On account of the heavy work of the Presidency Agricultural Show, Ahmedabad, I was posted on special duty as Joint Deputy Director of Agriculture, Gujarat, from 25th June to 31st December 1928.

3. Mr. G. P. Pathak continued to act as Cotton Superintendent, Surat, till Mr. C. S. Patel returned from Konkan on 9th November 1928.

II.—Season

4. The agricultural season of 1928-29 was very favourable for crops particularly cotton before the unprecedented calamity of very severe frost from 30th January to 2nd February 1929 which entirely killed the crops that were in flowers and damaged others from 25 to 80 per cent. except a coastal strip of 5 to 6 miles in Surat District which remained unaffected by frost.

III.—Research and Experimental Work

5. This consists of :—

- (1) Research on crops by breeding ;
- (2) Research in crop pests ;
- (3) Experimental Station work ; and
- (4) Experimental trials in cultivators' fields.

(1) RESEARCH ON CROPS BY BREEDING

Work in Surat District

6. *Work on Cotton.*—Surat 5¹ was compared with 1027 A.L.F. on 10 replications with a view to get reliable yield results.

Surat 5¹ yielded 2·8 per cent. less than 1027 A.L.F. However, the ratio of mean difference to standard error of mean difference was not significant. Yet Surat 5¹ is visibly inferior in opening of bolls compared with 1027 A.L.F.

With a view to build up a type having higher ginning outturn combined with other economic characters, crosses of 1027 A.L.F. with Nandyal 14, Aligarh 19 and Goghari A-26 have been made.

The Cotton Breeder continued to produce selfed seed of 1027 A.L.F. and purify the Farm crop to supply enough pure seed to the seed-growers of Surat tract. Some pure strains of cotton are being maintained.

7. *Jowar work*.—The most promising type Budh Perio 53 and Telia Chapti 26 were tested on 10 replications in comparison with Local Perio and Farm Chapti. Budh Perio 53 yielded 20.1 per cent. more than Local Perio and Telia Chapti yielded 4.47 per cent. more than Farm Chapti. So Budh Perio confirms the results of last year. The size, colour and lustre of the grain appear as good as those of the Local Perio. Some pure strains of Jowar are being maintained.

Work in Broach District

8. *Cotton*.—The crop was badly affected with frost. Broach 9¹ was suspected of high wilt susceptibility and therefore with a view to study its wilt susceptibility, it was grown in comparison with Farm local and cultivators' local on three types of land—(a) land with very little wilt, (b) land with medium amount of wilt (land once affected but partially improved by Jowar rotation for three years) and (c) land highly affected with wilt.

(a) On land with very little wilt, Broach 9¹ was less affected with wilt than cultivators' local but more affected than Farm local which is supposed to have acquired wilt resistance.

(b) On land with medium amount of wilt, plants of Broach 9¹ were affected to the extent of 42.1 per cent.; whilst cultivators' local Broach was affected to the extent of 26.4 per cent. and Farm local to the extent of 9.2 per cent.

(c) On land highly affected with wilt Broach 9¹ was almost wholly destroyed, i.e., 90 per cent.; while cultivators' local was affected to the extent of 60 per cent.

Thus the susceptibility of Broach 9¹ is decidedly proved and it is decided not to distribute this strain though it yields better for fear the wilt may spread throughout the tract in a very short time, from patches of wilt existing in almost all the districts, just as in Dharwar District, and then it may prove disastrous to the tract.

Besides, 9¹ was not ginning so high as Broach local.

9. *Rabi Jowar*.—Pure strains Nos. 5, 8, 10, 12 and 178 of Rabi Jowars were maintained on the Broach Farm and some of these will be tested in replications next season.

Work in Kaira District

10. *Tobacco work at Nadiad*.—Work on Tobacco Breeding is going on at Nadiad on the Farm of the Nadiad Agricultural Association loaned to Government for the purpose. Old Selections of local varieties of tobacco are maintained pure with necessary records of their economic characters.

Strain No. 6 which is popular in Gandiu tract and strain No. 28 which is suitable to replace local Piliu are grown for multiplying seeds, to supply pure seeds to the seed growers in the district as well as for trials in new areas. Some nine new selections are under study and No. 38 a promising strain will be tested on replication series to see its worth compared with local and improved strains.

11. *Crosses*.—For the local market, selection has given us a heavy yielding strain No. 6; but with a view to improve its quality it was crossed with “Bhengi” in 1926-27 and first generation was grown during 1927-28 and 8 selections of second generation were grown during the year under report for detailed study. They were found splitting. Some 11 selections are made for further study in third generation.

For the production of cigarettes, Adcock variety was found to be the best amongst cigarette varieties as regards colour and thinness of leaf, but burning quality was defective and yield was low. So it was crossed with No. 6 in 1926-27 to have better yielding strain. First generation was intermediate and seven selections of second generation were sown during the year under report. All were splitting and some five selections to the third generation will be grown for further study.

Unfortunately frost killed all tobacco plants and it was difficult to get real idea of yield and quality of these crosses.

The work of tobacco breeding is written upto date and will be published as a Memoir.

12. *Bajri at Nadiad*.—Unfortunately very little research work is done on crops of North Gujarat. So far, tobacco work touches a very small but important part of the tract. So it was decided to improve Bajri crop by selection if possible. A graduate from Surat was deputed for two months to assist the Tobacco Breeder for going over the Bajri localities of the whole of Gujarat including state territories and some 65 samples from 51 typical Bajri villages of Gujarat were collected. These vary widely and will form good material for selection work.

13. *Research work on fruit-culture*.—This is badly needed for North Gujarat. There are many wells with pumping plants and a large area is put under sour lemon which fetches very little price and requires the help of Science to make lime juice or to alter fruiting season by investigating proper treatment. Besides people are very keen to go in for other improved varieties of fruits if they can be shown how to grow them successfully. There is local market waiting to be supplied. Unfortunately a proposal for a fruit nursery is being talked of for the last 4 years but has not matured. What is wanted is not a nursery but a small plot of 2 to 3 acres with a well and pumping plant in a central place to demonstrate a successful fruit culture and to study the method of treatment to suit local conditions. It is hoped when Bajri and fruit researches mature, north Gujarat will not lag behind South Gujarat.

Ahmedabad District

14. *Cotton at Viramgam*.—Both the strains Wagad 4 and Wagad 8 maintained their superiority over the local, yielding 1,099 lbs. and

1,213 lbs., or 1·7 per cent. and 6·7 per cent. respectively more than the local which gave 1,081 lbs. and 1,137 lbs. respectively per acre. The ginning percentage of Wagad 4 was little less than that of local and hence its extension is restricted. The ginning percentage of Wagad 8 was 42·4 as against 39·8 of the local and its staple length 1·85 cms. against 1·81 cms. of the local.

Thirty-two selections were made out of 114 samples of local cottons with a view to sift them thoroughly.

15. *Selections from Cutch and Kathiawar Collections.*—Out of some selections from Cutch-Kathiawar Cottons tested during the year, selection C3·3·1 was most promising, as it was valued to fetch Rs. 15 more per candy than Wagad 4 which fetched the highest premium amongst the several strains, over the local.

Crosses.—Second generation of a cross of Wagad No. 8 and 1027 was grown during the year. They were splitting considerably. Only one plant out of 1,236 plants was just like Wagad in opening characters. Others were near it. Selections are made for further study. The back cross with Wagad No. 8 was made to get more plants opening like Wagad.

(2) RESEARCH ON CROP PESTS

16. *Work on Jowar Stem-borer at Surat.*—This work is financed from the Sir Sassoon David Trust Fund.

In this work we have now reached the final stage. The research so far has shown that the pest can be effectively controlled by "Stubble treatment and Stack treatment of Jowar Kadbi."

Early removal of stubbles and exposure to sun heat kills the borers hibernating in them.

Chaffing and storing of kadbi or covering the stack of kadbi to trap or kill all the emergence of the moths seems to destroy the pest. Trials are being made to verify these methods of control of pest.

Alternative food plants which help to carry over the pest in off season of Jowar are under close observation with a view to complete control of the pest.

17. *Katra Control Work at Nadiad.*—Mr. M. H. Desai, Entomological Assistant, Surat, was in charge of this work. The work was limited to trial of Kitson lamp light-traps. The attack of the pest was mild during the season. About 5,000 moths were caught by 8 lamps put over 80 acres for 6 nights.

The following observations have been made :—

- (1) Twenty to 32 per cent. of the moths trapped were females ; rest males.
- (2) All moths were not fully loaded with eggs.
- (3) Number of caterpillars in treated and untreated areas differed very little in favour of treatment.
- (4) All the moths were not attracted by light-but a number of them were found at a small distance of the light-traps and were laying eggs.

From these it was learnt that the method of putting light traps and the intensity of light traps were not known to us.

Besides, the incidence of damage in treated and untreated area must be known and strength of attack must be measured. Besides, the habit of the pest and particularly hibernation of the pest was not ascertained. So a plan to study all these points was prepared.

18. *Woolly Mites on Cotton at Surat.*—The Entomological Assistant, Surat, was studying the life history and habits, carry over, alternative food plants and also insecticidal and cultural study of the pest.

(3) EXPERIMENTAL STATION WORK

(a) *Surat Agricultural Station*

19. *Season.*—Though the total rainfall was only 26·21", it was most favourable for vegetative and reproductive growth of crops and for farm operations too. Crop matured three weeks earlier. Frost did not do any material harm, as a result the cotton and Jowar crop yields were normal.

20. *Cotton.*—The farm area was under 1027 A.L.F. for the production of pure seed for the Athwa Group seed-producers for the tract. The average yield of seed-cotton per acre was 540 lbs. as against 468 lbs. per acre in the cultivators' fields round about the farm.

21. *Jowar.*—The average yield of Jowar crop during the year was 930 lbs. per acre and the fodder outturn was exceptionally good.

Trial of Budh Perio 53 vs. Althan Deshi 6.

Strains.	Area in acres.	Yield per plot.	Yield per acre.	Remarks.
		Lbs.	Lbs.	
Althan Deshi Strain No. 6 ..	4-29	4,662	987	Early flowering.
Budh Perio Strain No. 53 ..	4-8	4,597	1,095	Late flowering.

Results of trial of these two varieties last two years on the Farm show that Budh Perio yielded 15 per cent. and 10·9 per cent. more than Althan Deshi 6 during the two seasons respectively.

22. *Ridging Experiment No. II.*—This was the seventh year of the experiment. Out of seven years of trial the results of this year only are against ridges, cotton on flat giving the best result and ridges with deep tillage standing second. However, collective results of seven years are in favour of ridges. Cotton on ridges with shallow tillage over seven years shows 6·4 per cent. more yield of seed-cotton over flat. Same way cotton on ridges with deep tillage shows an increase of 13·1 per cent. over flat.

Explanation is found in very favourable distribution of rain which showed there was no water-logging on flat and deep tillage on ridges was better than shallow tillage on ridges.

As regards Jowar as far as grain yield is concerned, of all the seven years this year's results are a bit different. Ridges with deep tillage give best results, second best is Jowar on flat. This year fodder yield follows the same course as grain. Only once before, fodder yield on flat was highest and ridges with shallow cultivation was second best. However, the collective results of last seven years are in favour of ridges.

Jowar on ridges with shallow intertillage gives an increase of 9.7 per cent. in grain and 4.5 per cent. in fodder and with deep intertillage gives an increase of 19.9 per cent. in grain and 9.4 per cent. in fodder over flat. From this it is clear that 14" ridges with deep intertillage gives significant difference, i. e., over 10 per cent. in yield of seed-cotton and Jowar grain.

23. *Manure with Ridges.*—Application of 10 tons of Farm yard manure every alternate year applied in furrows or trenches increased the yield of seed-cotton by 67 per cent. over the flat in spite of the cotton on flat being the best yielder this year. This means that a very favourable distribution of rainfall gives the best results with heavy manuring of 10 tons or that a very good distribution of rainfall is essential to get best out of heavy dose of Farm yard manure.

Average result of seven years' application of 10 tons of Farm yard manure in trenches to cotton on ridges (14" high in all cases) with deep intertillage shows an increase of 31.1 per cent. of seed-cotton over no manure to cotton on ridges with deep intertillage.

As regards Jowar, 10 tons manure plot on ridges during the year gave an increase of 211 per cent. in grain and 503 per cent. in fodder over flat. Whilst comparing 10 tons of manure on ridges with no manure on ridges the manured plot of Jowar shows an increase of 34 per cent. in grain and 110.8 per cent. in fodder over no manure plot. This again confirms the good effect of well distributed rainy season on manured Jowar just as in cotton. The experiment was in duplicate.

This experiment is discontinued at the end of the year.

24. *Ridge Experiment No. III.*—This experiment was in duplicate. Besides it is a bit faulty in having more than one variant in some cases of treatment. Only one item is comparable, viz., application of 4 cwt. of Castor cake every year in combination with application of 10 tons of Farm yard manure in alternative years to cotton. Average result of 6 years show that 4 cwt. Castor cake in combination with 10 tons of Farm yard manure on ridges gave 13 per cent. increase in seed-cotton over 10 tons of Farm yard manure alone on ridges.

In case of Jowar—Castor cake gave an average increase of 9 per cent. in grain and 20 per cent. in fodder over no cake in combination with 10 tons of farmyard manure over 6 years.

Four cwt. Castor cake applied to ridges cannot be compared with flat; but can be compared only with 10 tons of Farm yard manure every alternate year and over 6 years, 10 tons of Farm yard manure per acre every alternate year shows an increase of 25 per cent. in grain and 37 per cent. in fodder over 4 cwt. of Castor cake every year per acre. However, this was expected as cake alone cannot replace Farm yard manure.

25. *Breeding Herd on Surat Farm.*—The Breeding herd stood at 116 as against 102 of the last year. The herd has 4 adult bulls and 38 adult cows, 10 heifers, 33 cow-calves and 31 bull-calves.

The total milk yield during the year was 84,306 lbs. and 12 ozs. as against 62,007 lbs. and 12 ozs. of the last year. The average number of adult cows during the year was 30·9 out of which 21·1 were in milk. The average milk yield per head of the herd (inclusive of old cows and new calvers) was 2,727·4 lbs. per year as against 2,443·5 lbs. of the last year.

The percentage of dry animals to total animals comes to 31·8.

26. The following is the list of some of the best milk producers in the herd with their record against each :—

Name of Family (Dam side.)				Name of cow.		Period under study.		Average annual milk yield.
						Yrs. mths.		Lbs.
Gopi	..	..	..	Anpurna	..	14	0	3,057
Do.	..	..	..	Aileen	..	5	10	3,209
Bhima	..	..	..	Popati	..	8	3	3,373
Prayag	..	..	..	Rukhi	..	6	0	3,241
Do.	..	..	..	Radki	..	4	3	4,014.
Kashi	..	..	..	Prabha	..	1	1	3,523

Stud Bull Agakhan comes from Gopi family from Dev-Anpurna.

Stud Bull Padshah comes from Kashi Family from Kevdo-Pitambri.

(b) *Amalsad Farm*

27. Sugarcane varieties reported last year were maintained on the Farm for further observations.

Ginger and Turmeric were tried on broad ridge method *vs.* Local bed system. Ginger gave very little increase in yield on broad ridge method but Turmeric on broad ridges gave an increase of 25 per cent. in yield over bed method.

However there were no duplicate nor the plotting and manuring was properly done, so the whole plan of experiment has been reorganised.

(c) *Dohad Farm*

28. *Maize*.—Spacing experiments with maize as a result of sowing by 2' drill and by a plough 15" to 18" apart between two rows showed that sowing by 2' drill invariably gave best yield of maize during the last 11 years. The average yield of maize sown 2' apart by a drill was 1,237 lbs. per acre against 764 lbs. per acre of the maize sown 15" to 18" apart by a plough, showing an increase of 61 per cent. in favour of sowing 2' apart by a drill.

The following pure seeds were supplied to the Garbada Co-operative Societies as last year :—Wheat Pusa₄ 2,536 lbs. ; Wheat Baxi 1,060 lbs. ; Wheat Wajia 1,020 lbs. ; Gram 10,880 lbs. ; Maize 4,800 lbs. ; Groundnut Spanish Peanut 3,480 lbs.

29. *Maize Breeding*.—Though maize is an important chief crop of the Panch Mahals, the work of maize breeding had to be postponed for want of funds for staff and equipment. It is a pity that no research by breeding can be undertaken for this backward District.

(4) EXPERIMENTAL TRIALS IN CULTIVATORS' FIELDS FOR INTRODUCTION OF NEW CROPS OR METHODS

30. *Cotton*.—In Broach District 9¹ cotton on an average of 5-plots yielded 259 lbs. of kapas as against 212 lbs. of the Local. But as remarked elsewhere its distribution has been dropped owing to its high susceptibility to wilt disease.

In South Daskroi and Godhra, the trial of 1027 A.L.F. was seriously affected by frost. At Viramgam two trials of Wagad 8 showed an increase in yield by 53·4 per cent. and 6·9 per cent. respectively over the Local cotton. It has been decided to promote Wagad 8 instead of Wagad 4 as Bavla people reported that No. 4 had less ginning than on Viramgam breeding Station. As a result, distribution of Wagad 4 is stopped pending inquiry into the ginning percentage of local cotton in the District.

31. *Jowar*.—Budh Perio No. 53 tried at Bhadol, Taluka Olpad, did fairly well as compared with the Local Jowar, though damaged by hail-storm. At Talangpur in Chorashi Taluka and Kharsad in Jalalpur Taluka, this improved type yielded 679 and 979 lbs. against Local Perio giving 304 and 726 lbs. only respectively per acre.

32. *Rice*.—Kolamba No. 79 tried at Sandhier, Taluka Olpad, gave 2,340 lbs. against 2,320 lbs. of the Local Kada rice which is coarser than No. 79.

33. *Wheat*.—120 lbs. of seed of wheat strain No. 224 tried at Arnej, Tagadi and Ranpur in Dholka and Dhandhuka Talukas gave encouraging results (viz., 60 lbs. more per acre) and the cultivators have reserved 1,000 lbs. from the produce as seed for the coming season. This strain does not tiller much so it is planned to sow it thicker.

34. *Tobacco*.—Improved strain No. 6 tried at following places proved its superiority over the Local :—

Name of place.	Taluka.	District.	Outturn in lbs.*per acre.	
			No. 6.	Local.
Sandhier.. ..	Olpad ..	Surat ..	1,333	1,066
Hinglot ..	Broach ..	Broach ..	1,600	960
Kalod ..	Do. ..	Do. ..	1,200	1,000
Akot ..	Wagra ..	Do. ..	1,040	840

The trial at Vejalpur and Harkundi in Godhra Taluka gave an increased yield by 17·3 per cent. and 14·2 per cent. than Local respectively.

In Kaira District comparative tests of Tobacco No. 6 were taken with Local on 19 plots in 10 villages with results invariably in favour of the improved strain. Number 28 too has given better results in two villages when compared with Local Piliu.

35. *Manurial Trials*.—In Kaira District trials of Nitrate of Soda, Sulphate of Ammonia and Bone-meal to Tobacco crop were taken, but the frost vitiated the results.

IV.—Organisation and Propaganda

36. *Divisional Board*.—Two meetings were held on 28th August 1928 and 8th September 1928 under the Chairmanship of the Deputy Director of Agriculture, Gujarat, and one on 24th February 1929 under that of the Assistant Registrar, C. S., N. D., Surat, who was the Chairman from 1st November 1928. There was no change in the Propaganda Officers.

37. *Taluka Development Association*.—The success of the Association depends on enthusiast non-official workers who try to collect necessary funds and carry out the agricultural work with some enthusiasm.

The Association like Borsad Association that has raised good fund once for all is free from the usual annual anxieties of collecting enough quota to carry on the work.

Mamlatdars and Deputy Collectors are very helpful in starting such associations and running them. However, the constitution of the Taluka Development Associations is entirely autonomous and the people who raise the funds have full control over the working. The Departmental Officers give free guidance and Government are giving half the expenses without any interference, and such an institution for the good of the agriculturists ought to be more popular.

The Anand and Borsad Taluka Development Associations took great pains in the multiplication and extension of Tobacco Strain No. 6. Other Associations did good work as usual.

38. *Agricultural Co-operation.*—District Agricultural Overseers are trying to work their propaganda through Co-operative Societies wherever possible. Through the Garbada Group Co-operative Societies pure seeds of maize, Spanish Peanut, Pusa 4, Baxi Wheat and Yellow Gram from the Dohad Farm as stated in paragraph 28 were distributed with the help of the Special Mamlatdar, Co-operative Societies, Dohad.

39. *Cotton Transport Act.*—This remained in force in the amended form and no barrier was put on the river Tapti to prevent import of kapas from its North. Unfortunately, cotton growers North of the river are not taking up 1027 A.L.F. seed in place of Selection I-A to which they are sticking, with the result that Selection I-A seed is slowly permeating in the South area and if no control is exercised, the idea of putting the whole of the Surat tract under one strain will not be realised. Besides Selection I-A is not pure and is likely to degenerate fast from year to year and may come down to old Local type of Surat cotton.

40. *District Cotton Work: Surat Tract.*—During the year under report, the area of 1027 A.L.F. cotton grown under the supervision of the Department was 10,909 acres 16 gunthas. From this area the quantity of Kapas produced was 3,348 Bhars 3 maunds and 20 seers (=3,214,220 lbs.) which was ginned at 4 centres under supervision of the Cotton staff. This yielded 1,230 Candies (=1,033,200 lbs.) of lint which was sold in the open market and realised a premium of Rs. 10 to Rs. 20 per candy. The quantity of seed purchased from the Director of Agriculture's Personal Ledger Account was 1,016 Gallis 23 maunds and 5 seers and this was distributed from the Depôts at the ginneries. The cotton growers had made their own arrangements for getting advances from the gin-owners direct and under this arrangement, there was no trouble in getting seed from their produce.

Owing to frost the quality of the cotton was spoiled, and there was no brisk demand in the market. The rates which in the beginning rose up to Rs. 475 went down to Rs. 400 per candy by the end of the season. Due to bad quality and unfavourable market, the cotton growers of the District had to undergo much financial losses. Owing to very low rates for raw kapas, many cultivators went in for selling ginned cotton, but due to above two reasons the prices realised were not good.

41. *Broach Tract.*—The distribution of 9¹ cotton seed has been stopped owing to its high susceptibility to wilt disease. San seed for green manuring is more and more in demand in certain part.

42. *Ahmedabad District.*—The cultivation of Wagad 4 and Wagad 8 reached 595½ and 12 acres respectively during the year, the latter being started afresh as the previous crop was totally destroyed during floods of 1927-28. Due to frost during the year the quality was not uniform. However, yield of Wagad 8 was higher than Local and only 171½ maunds

(6,860 lbs.) of seed was obtained and distributed in Bavla, Rupal and Arnej of Dholka Taluka. In spite of the complaint of low ginning of Wagad No. 4, Bavla Farmers have readily taken the seed for further sowing.

43. *Tobacco No. 6.*—Three hundred and fifty-one lbs. of seed of this improved type was distributed to cover about 800 acres in Kaira District where it has now passed its experimental stage, having become popular due to its higher yield than Local Gandiu. For production of pure seed to meet the increasing demands, Tobacco No. 6 was specially grown on an acre on the Poona Agricultural College Farm which gave about 1,000 lbs. of seed. Arrangements are made to meet from this stock all demands from out-side Gujarat.

Borsad and Anand Taluka Development Associations arranged to have the seed of No. 6 grown by two good seed growers, for supplying the needs of the tract. This crop was rogued by the Tobacco Breeder, Nadiad, to safeguard the purity.

The crop of Tobacco was badly affected by frost and it was doubtful to get back reliably pure seeds from various cultivators to whom it was issued on condition to return double the quantity and as most of the cultivators who grew No. 6 produced seed for their use, the condition of taking back double the quantity was waived and the seed was arranged to be sold at Re. 0-8-0 per lb.

44. *The Presidency Agricultural Show* was held at Ahmedabad from 17th to 28th November 1928. Though it had to face a series of obstacles, it turned out successful. The whole staff devoted its attention towards the Show work for over five months.

The services of Mr. K. D. Naik with a Non-graduate Assistant were lent to the Show from about the middle of May 1928 to manage the Crop Court Section which he did very satisfactorily. The whole Office of the Deputy Director of Agriculture, Gujarat, Surat, was temporarily transferred from Surat to the Show grounds at Ahmedabad from 6th July 1928 and that of the Entomological Assistant, Surat, from 10th September 1928.

All the District staff was fully busy in collecting exhibits for the Show. The Deputy Director of Agriculture, Gujarat; the Joint Deputy Director of Agriculture, Gujarat, the Divisional Superintendent of Agriculture, Northern Division, and the District Agricultural Overseer, Ahmedabad, with their Office staff, were busy with the Show work primarily. The different sections organised and Managed by the Gujarat Agricultural staff were Field Produce, Agricultural Propaganda (consisting of Crop Court, Pestology Court, Organisation Court, Marketing, etc.), Transport and Storage, Publicity, General, Subsidiary Occupations, Visitors and Amusements. All the agricultural staff in this Division, as far as available was engaged in working as demonstrators during the Show period.

The total number of exhibits under the Field Produce Section was 6,211 of which 3,060 were from Gujarat Division, excluding 476 from

the Baroda and Bansda States. The following is a list of prizes awarded :—

District.	Number of medals.					Cash prizes.	
	Gold small.	Silver large.	Silver small.	Bronze large.	Bronze small.	No.	Amount.
Surat ..	1	2	..	..	10	32	Rs. 240
Broach ..	..	..	..	..	4	21	157
Kaira ..	2	..	..	1	17	50	255
Panch Mahals ..	..	..	..	..	12	25	96
Ahmedabad ..	1	..	1	..	12	21	101
Total ..	4	2	1	1	55	149	849

Besides these, one large gold medal as the first Presidency Prize was awarded to Patel Kalyanbhai Kashibhai of Saijpur, Taluka Borsad, District Kaira and two small gold medals each as the second Presidency Prize to Rao Saheb Bhailalbhai Bhikhabhai of Boriavi, Taluka Anand and Mr. Thakorbbhai Gulabbhai Desai of Athwa, Taluka Chorashi, District Surat.

45. *Petty Demonstrations.*—Owing to the Presidency Agricultural Show at Ahmedabad and occurrence of frost, no other big demonstration or show was held during the year. But 76 petty demonstrations were occasionally held at various places to show practical working of improved implements and improved methods.

46. *Implement Depôts.*—The six depôts were continued with a slight change in that the Bulsar Depôt was shifted to Pardi with a view to introduce improved implements in the backward tract through the Pardi Taluka Development Association. It seems, however, there are no better prospects as it is chiefly a rice growing tract. To make Implement Depôts more serviceable, the depôt-keepers have been asked to take up intensive implement demonstration within a radius of 5 miles round about their head-quarters and the results are closely watched. The hire charges earned by the Depôts during the year amounted to Rs. 56-3-0 as against Rs. 50-14-0 of the last year.

47. *Introduction of new crops.*—(a) Kolamba No. 42 has been grown in South Daskroi on about 68 acres.

(b) Kolamba No. 79 is introduced in Pardi Taluka by the Taluka Development Association and in other parts of the Surat District it is being tried.

(c) Pusa 4 has spread over $\frac{1}{4}$ th of the total wheat area of Dohad-Jhalod tract owing to rust being very serious in Local Wheat known as Wajia.

(d) Arrangements have been made to purify Spanish Peanut variety of groundnut in Dohad Taluka through the Garbada Co-operative

Society. The Dohad Farm is to grow it pure on 8 acres every year for seed supply in the Taluka.

48. *Distribution of seeds.*—Important seeds distributed were 6,800 lbs. cotton seeds in Broach District, 20,369 lbs. cotton seeds in North Gujarat, 21,377 lbs. Wheat, 9,332 lbs. Pure Groundnut, 21,067 lbs. Maize, 22,477 lbs. Gram, 437 lbs. Tobacco, 15,760 lbs. Sansed and 24,250 Sugarcane sets and 514 Grafts of fruits and plants.

49. *Distribution of Implements.*—3 B.T. 2, 4 C.T. 2 and one Ridge plough in all worth Rs. 505 were distributed in Surat District, and two Sultan Sugarcane Crushers in Kalol, 4 Meston Ploughs and one McCormic Cultivator in Godhra in all worth Rs. 595-8-0 were distributed.

50. *Distribution of Manures* was as under :—

	Surat District.	Broach District.	North Gujarat.
	lbs.	lbs.	lbs.
Sulphate of Ammonia	10,440	1,380	116,832
Nitrate of Soda .. ..	....	130	47,768
Bone-meal	80	....	86,020
Denatured salt	24,000	3,520	....

As a result of successful manurial trials, farmers in North Gujarat are freely going in for these manures particularly for rice and Tobacco.

51. *Distribution of Copper Sulphate packets.*—In all 3,526 packets were distributed during the year. As Sulphur dusting for prevention of smut in Jowar is found more economical, it will be taken up next year in place of copper sulphate packets.

V.—Agricultural Services

52. *Boring.*—Out of 36 bores undertaken during the year (including the one left incomplete last year) 25 bores or 78 per cent. were successful, 4 abandoned, 3 failure and 4 left incomplete (*vide* detailed statement attached). Total depth bored was 2282'-3" and quantity of water tapped was 36,200 gallons per hour. The failure was due to saltish water in one bore and in other two cases due to the accidents not recovered. Out of six accidents that occurred during the year, four were successfully recovered. Besides these bores, one tube well 60' deep was made at the Presidency Agricultural Show, Ahmedabad, to demonstrate the working of the Boring Machine, and one bore on the Chharodi Farm was cleaned. Out of 7 boring machines working in this Division, one machine No. 1 Armstrong 6" was worked in Pardi Taluka in consultation with the President of the Pardi Taluka Development Association. It made eight bores, of which five were successful, two failed due to unfavourable strata and one was incomplete.

The two boring machines lent to the Karia District Local Board bored 12 wells to a total depth of 1240', of which 9 were successful.

The total expenditure, including permanent establishment during the year was Rs. 16,046-10-3, and the total recoveries of boring charges were Rs. 2,509-14-9, those in arrears being Rs. 4,969-14-3 (consisting of Rs. 1,944-9-0 belonging to the Personal Ledger Account and Rs. 3,025-5-3 to Departmental charges).

53. *Mechanical Help*.—The Mechanical Assistant executed 7 works during the working season from 1st October 1928 to 3rd January 1929 when he was transferred as Acting Boring Overseer under the Agricultural Engineer to Government of Bombay, Poona. Due to absence of a suitable man to take his place at the nick of time, inquiries from cultivators for Mechanical help remained unattended for a long time and so the demand for such help was abnormally less during the year. A fitter, however, was sent from Poona to execute the pending works under guidance of the Acting Boring Overseer, Poona and only 6 works were attended by both. Out of 13 works in all carried out during the year, 5 belonged to Government, 4 to individual cultivators, 1 to Local Board and 3 were in connection with the Ahmedabad Show.

54. The transfer of the Mechanical Assistant to the Agricultural Engineer to Government of Bombay, Poona, dislocated the work of the Division and it is hoped that this difficulty will be overcome in future by putting all the executive mechanical and boring staff in the Presidency in one group with different grades of time-scale pay so that the transfer of Divisional staff may not be necessary in case of promotion.

VI.—Agricultural Education

55. *The Vernacular Agricultural Schools at Godhra and Surat*.—These have completed their 9th and 6th year respectively. The year under report opened with 23 and 31 boys respectively. The number of 11 and 15 in the first year were enrolled at Godhra and Surat respectively. Seven out of 11 in the first year and 9 out of 12 in the 2nd year were successful at Godhra School, whilst all 31 were successful at Surat.

The total expenditure of the Godhra and Surat Schools during the year was Rs. 9,455-1-0 and Rs. 9,446-1-3 and receipts from the sale proceeds Rs. 440-1-3 and Rs. 581-5-8 respectively. District Local Boards of Surat and Panch Mahals contributed Rs. 500 to the Surat School and Rs. 100 to the Godhra School respectively.

The average boarding expenses per boy per month to Government at Surat and Godhra was Rs. 8-8-0 and Rs. 10-12-1 whilst the total cost was Rs. 30 and Rs. 34-4-1 respectively. Owing to heavy charges of such schools, the question of reducing their cost and even the closing of one of two schools in the Division is under consideration, unless the expenditure is shared by the Local Board concerned.

It would be interesting to note the history of the past students that successfully went out from the schools given in short as under :—

	Surat.	Godhra.
(1) Total number of boys that passed out.	48	97
(2) No. in agricultural occupation ..	17	56
(3) No. in Educational Department's service.	7	..
(4) No. in Agricultural Department's service.	4	9
(5) No. in Public service Government or State.	..	4
(6) No. in private service ..	5	1
(7) No. in occupations other than agriculture.	5	11
(8) No. attending further study ..	2	1
(9) No. died ..	1	..
(10) No. whose further information is not known.	7	15

56. *Rural Schools with an Agricultural bias.*—There are 11 Agricultural Bias Classes in primary Schools. The District Agricultural Overseers helped the Agricultural Bias classes with advice required from time to time and also helped the School authorities in holding their annual examinations.

VII.—Publicity

57. The publication of the Broach quarterly magazine was continued besides publishing articles on agricultural matters in Local papers amongst which the Gujarat Mitra and Gujarat Darpan of Surat as usual rendered most valuable service. The Departmental publication for which material was supplied by the Officers from this Division during the year was Leaflet No. 1 of 1929.—Tobacco in Gujarat (to replace No. 3 of 1911).

VIII.—Miscellaneous

58. In preparation of land for Tobacco in Kaira, it is the usual practice to plough the land 7 or 8 times with a wooden plough but the object of this after one or two thorough ploughing is simply to leave the land rough for absorption of rain water and therefore a cultivator with 3 times 12" apart but heavier than three coultered drill is made to work in place of a Local plough with a view to reduce the cost of working from $\frac{1}{2}$ to $\frac{1}{4}$ the present cost each time. Its working is watched.

59. *Personal.*—The staff on the whole put in conscientious and hard work during the year.

B. S. PATEL,

Surat, the 27th July 1929.

Deputy Director of Agriculture,
Gujarat, Surat.

APPENDIX

Serial No. of Bores.	Names of the well owners.	Taluka.	Village.	Diameter of Bores.	Depth of Bores.	Water before boring in gallons per hour.	Water after boring in gallons per hour.	Departmental charges.
1	2	3	4	5	6	7	8	9
	BORES LEFT INCOMPLETE LAST YEAR, AND COMPLETED IN THIS YEAR							Rs a. p.
	<i>Ahmedabad District.</i>							
2	Mr. Dahyabhai Nathobhai.	North Das-kroi.	Tragad	4"	(187') 15' in 1928-29.	1,000	3,000	255 8 0
	NEW BORES—1928-29							
	<i>Ahmedabad District</i>							
1	Mr. Rema Nathoo ..	Sanand ..	Soyala ..	3"	27'	250	2,250	27 0 0
2	" Ishwarbhai Dalabhai.	North Das-kroi.	Chandolia.	4"	51'	1,000	2,000	51 8 0
3	" Mansukhbhai Dahyabhai.	Sanand ..	Vasodara ..	3"	66'	500	4,500	65 0 0
4	" Venibhai Ganesh	North Das-kroi.	Ghantodia.	4"	51'	1,000	3,000	51 8 0
5	" Shankarbhai Dharamdas.	Do. ..	Do. ..	4"	70'	500	2,500	80 0 0
6	Bai Mani Gurdian of Indravadan Sakatchand.	Do. ..	Paldi ..	3"	67'	2,000 Saltish	3,000 Sweet.	75 8 0
7	Mr. Shah, Dipchand Jaymal.	Dholka ..	Rasam ..	3"	141'	500	2,500	186 8 0
8	Sir Chunibhai Madhavai Ranchhodai Baronet.	North Das-kroi.	Shahibag ..	4"	45'	2,000	5,000	45 0 0
9	Do. ..	South Das-kroi.	Maninagar	4"	80'	2,000	4,000	95 0 0
10	Local Board well ..	Sanand ..	Laypura ..	3"	65'	225	2,225	72 8 0
11	Do. ..	Do. ..	Rainpara ..	3"	95'	..	..	..
	<i>Surat District.</i>							
1	Public Works Department well at Police Lines.	Chikhli ..	Chikhli ..	4"	..	..	..	..
2	Mr. Jamsedji Cawasji Dastoor.	Pardi ..	Koprol ..	6"	47'	500	1,500	47 0 0
3	" Madhavbhai Narabhai.	Jalalpore ..	Khad Supa	4"	129'	Nil	700	168 8 0
4	" Dullabh Haribhai	Pardi ..	Kikarla ..	6"	57'	500	1,500	60 8 0
5	" Gopal Mavji ..	Chikhli ..	Gandeva ..	4 1/2"	23'	..	..	..
6	" Kunverji Dahyabhai.	Pardi ..	Palsana ..	6"	50'	500	1,500	50 0 0
7	" Chhotubhai Naraji.	Chikhli ..	Kanbhai ..	..	176'	..	..	..
8	" Gopal Mavji ..	Do. ..	Gandeva ..	4 1/2"	53'	225	1,225	54 8 0
9	" Khandubhai Nagarji.	Pardi ..	Palsana ..	6"	40'	..	..	..

Labour charges. 10	Cost of pipes and shoes. 11	Cost of fuel and lubricant. 12	Total cost of Boring. 13	Cost per foot. 14	Remarks. 15
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
275 0 0	247 12 0	404 4 0	882 8 0	4 11 10	Successful.
28 3 0	44 0 0	8 3 0	108 0 0	4 0 0	Do.
31 0 0	65 0 0	8 10 0	156 2 0	3 1 0	Do.
40 0 0	82 0 0	13 12 0	200 12 0	3 5 6	Do.
26 0 0	76 12 0	8 10 0	162 14 0	3 3 1	Do.
51 4 0	101 8 0	10 4 0	243 0 0	3 7 7	Do.
140 0 0	67 0 0	11 4 0	263 12 0	3 15 0	Do.
172 8 0	122 12 0	35 0 0	516 12 0	3 10 7	Do.
135 8 0	61 13 0	20 0 0	262 8 0	5 13 3	Do.
92 10 0	114 0 0	15 4 0	316 14 0	3 15 5	Do.
36 0 0	82 0 0	13 12 0	204 4 0	3 2 3	Do.
....	....	....	....	....	Incomplete.
116 12 0	....	85 0 0	201 12 0	19 10 11	Failure due to very hard rock; work abandoned.
15 0 0	94 0 0	26 8 0	182 8 0	3 14 2	Successful.
62 8 0	136 0 0	39 0 0	406 0 0	3 2 4	Do.
8 0 0	92 0 0	35 12 0	196 4 0	3 7 1	Do.
45 0 0	....	10 0 0	55 0 0	2 6 3	Failure. Bore abandoned as the tool was sticking.
20 0 0	85 0 0	14 0 0	169 0 0	3 6 1	Successful.
....	....	....	....	....	In progress.
60 0 0	49 0 0	21 0 0	185 0 0	3 7 10	Successful.
12 0 0	....	8 0 0	20 0 0	0 8 0	Failure. Bore abandoned as was filled in.

Serial No. of Bores.	Names of the well owners.	Taluka.	Village.	Diameter of Bores.	Depth of Bores.	Water before boring in gallons per hour.	Water after boring in gallons per hour.	Departmental charges.
1	2	3	4	5	6	7	8	9
	<i>Surat District— contd.</i>							Rs. a. p.
10	Mr. Nanubhai Lallubhai.	Olpad ..	Sayan ..	4"	21'	..	..	..
11	" Koli, Lallu Kanji	Pardi ..	Palsana ..	6"	45'	590	1,500	45 0 0
12	" Gopal Mavji ..	Chikhli ..	Gandeva ..	4½"	28'	225	1,225	28 0 0
13	" Koli, Lallu Kanji	Pardi ..	Palsana ..	6"	35'	1,500	1,500	..
14	" Nanubhai Lallubhai.	Olpad ..	Sayan ..	..	99'	..	..	..
15	" Vithal Bhikha ..	Pardi ..	Dungri ..	6"	77'	500	1,500	90 8 0
16	" Framji B. Garda.	Jalalpore ..	Jalalpore ..	..	108"	..	..	..
17	" Vithal Ramji ..	Pardi ..	Pardi ..	6"	31'	500	1,000	31 0 0
	<i>Broach District.</i>							
1	Mr. Noor Mohamad Haji Mohamad Khedar.	Ankleshwar.	Kansia ..	4"	135'	1,000	1,900	..
2	Do. ..	Do. ..	Do. ..	4"	36'	1,000	2,500	36 0 0
3	Do. ..	Do. ..	Do. ..	4"	36'	250	1,250	36 0 0
4	Mr. I. W. Moomam.	Ankleshwar.	Anklesar ..	4"	50'	500	1,000	50 0 0
5	" Do. ..	Do. ..	Do. ..	4"	92'	1,000	2,000	113 0 0
6	" Mohamad Basool Pirbhai.	Hansot ..	Ganpatpura	4"	79'	..	..	..
	<i>Presidency Agricultural Show, Ahmedabad.</i>							
1	Show Ground, Ahmedabad.	.....	Shahibag ..	4"	60'	..	..	..

Labour charges.	Cost of pipes and hoses.	Cost of fuel and lubricant.	Total cost of Boring.	Cost per foot.	Remarks.
10	11	12	13	14	
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
50 0 0	....	20 0 0	70 0 0	3 5 4	Failure due to accident not removed.
10 0 0	71 0 0	29 8 0	155 8 0	3 7 3	Successful.
24 12 0	48 0 0	6 4 0	107 0 0	3 13 2	Do.
18 0 0	....	14 0 0	32 0 0	0 14 7	Failure. Abandoned due to hard rock.
....	....	....	....	....	In progress.
10 0 0	40 0 0	35 8 0	176 0 0	2 4 6	Successful.
....	....	....	....	....	In progress.
24 0 0	....	27 8 0	82 8 0	2 10 7	Successful.
90 0 0	176 8 0	43 0 0	309 8 0	2 4 8	Failure due to saltish water tapped.
30 0 0	68 0 0	18 0 0	152 0 0	4 3 7	Successful.
32 0 0	59 0 0	16 8 0	143 8 0	3 15 9	Do.
30 0 0	58 0 0	15 6 0	153 6 0	3 1 1	Do.
105 0 0	126 8 0	40 12 0	335 4 0	4 3 0	Do.
135 0 0	114 0 0	50 0 0	299 0 0	3rd December 1927.	Failure due to accident not removed.
....	....	....	....	....	Successful. Pipes were withdrawn as it was meant only for Show.

B. S. PATEL,
Deputy Director of Agriculture, Gujarat.

APPENDIX G

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, KONKAN DIVISION, RATNAGIRI,
FOR THE YEAR 1928-29

Staff

From July to October 1928 Mr. C. S. Patel was in charge of this Division, while Mr. V. V. Gadgil took charge of the Konkan Division from 1st of November 1928 and continued to hold the same throughout the year. Mr. V. G. Gokhale is now permanently transferred to Poona as Professor of Agriculture.

The staff of this Division consisted of the following :—

18 Graduate Assistants including the Betta Overseer—

- 9 Graduates engaged in research work.
- 8 Graduates engaged in District Propaganda Work.
- 1 Graduate engaged in Agricultural Education.

—
18

11 Non-graduate Assistants—

- 5 Non-graduate Assistants engaged in Research Work.
- 4 Non-graduate Assistants engaged in District Propaganda Work.
- 2 Non-graduate Assistants engaged in Agricultural Education.

—
11

Five Kamgars engaged in District Propaganda Work.

Besides these there is 1 Boring Assistant, 8 Mechanics and 7 Mates engaged in the boring work of the Konkan Division.

The work of the Konkan Division is summarised under the following heads :—

- I. Research.
- II. Propaganda.
- III. Agricultural Organisation.
- IV. Agricultural Services.
 - (a) Boring work.
 - (b) Elephant Shikaris.
- V. Agricultural Education.

Season

Regular monsoon commenced in the South Konkan in the first week of June 1928 and it was extended in the North in the second week. Unlike the past the rains were so very heavy in the beginning especially in Ratnagiri and Kolaba districts that in many parts, rice seed has to be sown. The heavy rains also delayed the sowing of drilled rice in the upghat tracts of the Kanara District. After the first heavy rain,

there was a break in Thana and Kolaba districts, which delayed preliminary operations of ploughing and transplanting. In the South the rains were seasonable and the transplanting operations and the sowing of *rahu* (sprouted seed) were quite in time. The rains in the month of August and September 1928 were as usual. But the stormy showers of October were injurious to the crop and delayed the harvesting of rice. On the whole the season was favourable for rice crop in the South Konkan while it was not very satisfactory in the North.

In the Thana and Kolaba districts, want of sufficient rains for timely puddling operations and heavy rains at the time of flowering, affected adversely on the rice crop and the yield was reduced from 15 to 20 per cent. below the normal, although the total rainfall was somewhat above the average.

The season for *rabi* crops was not so favourable due to the heavy rains of October and November 1928 which kept the fields moist for a longer period and consequently the sowing of *rabi* crops was delayed. The late sowing of *wal* and other *rabi* crops, reduced the yield of the crops to a considerable extent. In the Thana District, the cold wave of January and February 1929 affected the *rabi* crops like *wal*, chillies and tomatoes which yielded a poor outturn.

During the year under report, there was no insect pest of serious nature affecting the rice crop of Konkan except in the parts of Kanara and Ratnagiri districts where kanne fly pest (patchy deplois oryzen) made its appearance. But the damage was milder than that of the previous year. In parts of Ratnagiri District, the swarming caterpillars damaged the rice crops to the extent of 5 per cent. In the case of mangoes, which is a very important crop in Konkan, the first flush of flowers had a severe attack of jasside hoppers, while the second flush had a verulent attack of mildew. These attacks frustrated the high expectation of the mango season although the trees were full of blossom. The mangoes yielded from 6 to 8 annas crop.

In the betelnut gardens of Kanara, *koleroga* disease was more serious than that of the previous year. The trouble of rats and bats for cocoanut and betelnut, continued as usual causing more than 20 per cent. of damage.

I.—Research and Experiments

(1) Rice

Rice breeding and selection.—This work was continued on the Ratnagiri and Kumta Farms. From the past experience it was found out that the strains selected at Ratnagiri were unsuitable for Kanara, and hence selection and breeding of rice were started on the Kumta Farm for Kanara District during the year under report. At the Ratnagiri Farm white grained Kudai strain No. 25 and red grained Kudai strain No. 42 were found superior among the early varieties. These have given 15 per cent. more yield than that of

the local and their significant value is 3.11 and 4.25 respectively. Strain No. 42 will replace the local *patni* variety of Devgad, Malvan and Vengurla talukas, while strain No. 25 will be introduced in Chiplun, Sangameshwar and Ratnagiri talukas to replace the same *patni* variety. Out of the intermediate varieties Panwel strain No. 61 and *bhadas* strain No. 79 have yielded 17 per cent. more yield over the local and their significant value is 4.9 and 4.7 respectively. These will replace the local *Vakasal* variety of the northern four talukas of the Ratnagiri District. Strain No. 61 was also tried in the Dapoli Taluka and very encouraging results have been obtained during the year under report.

Ratnagiri Farm is not suitable for the late strains as they are badly affected by borers and hence a special sub-station has been opened at Sakharpa 30 miles east of Ratnagiri, where all the late and some intermediate varieties of rice were tested. From the results of the last two years, white strain Nos. 60 and 64 and red strain Nos. 92, 98 and 198 have given 20 per cent. more yield over the local *Vakasal* variety and they will be tried on a fixed scale according the Fisher's method in the coming season.

On the Kumta Farm 279 bulk samples were collected from all the talukas of the Kanara District and they were grown in 1927-28. Out of these samples the following number of promising plants were selected during the year under report.

(1) Early red kernelled	..	..	..	128
(2) Early white kernelled	..	..	..	54
(3) Late red kernelled	..	..	..	387
(4) Late white kernelled	..	..	..	247

The early strains represent Dasarpatiti variety, while the late ones were selected from Halga rice. Further selection will be continued from these plants. In 1926-27, 99 individual plants were selected from the local variety of Bhatkal, Honawar and Kumta talukas for their high yielding capacity. Out of these, early red strain No. 1061 and early white No. 1012 have given up to 48 per cent. increased yield over the local one during this year. The former comes from the *jaddu* variety of Bhatkal and the latter from the Muskati variety. These will be tried on a field scale on the farm as well as on the cultivators' fields in the coming season. Among the late group of the selection of 1926-27, strain Nos. 1501, 1558 and 1548 (all of red type) have given appreciable increased yield over the checks.

During the year under report, the "kanne pest" did not appear on the Kumta Farm at all and hence the resistance of these strains against kanne could not be observed.

Rice Research at Karjat.—The chief object of investigation at the Karjat Rice Research station, is to increase the yield of rice by means of other than breeding which must be both economical and within the reach of an ordinary cultivator. As mentioned in paragraph 10 of the past year's report, the yield of rice can be increased by increasing the

number of earheads per acre and the weight per head simultaneously and this can be achieved by judicious use of manures like sulphate of ammonia and certain green manures which are efficient in trap soils.

It was pointed out in the past that it was easy to produce 10 lac earheads per acre but it remained to find out, the ways of increasing the weight per earhead. It was also observed this year that the weight of earhead is not affected by the form of manures such as organic or inorganic but only by the availability of its nitrogen. It was observed that if nitrate of soda be applied in the latter stages of plant growth (*i.e.*, at flowering) the weight of earhead is increased.

Another experiment to increase the weight of earheads was to make the plant food available to the rice plant according to its needs, the periods of which were determined by plant analysis. Investigations in these directions have been in progress for the last 3 years but the results are still confounding. It was observed that the increased yields, due to these manures recovered only 25 per cent. of the added nitrogen. Experiments for finding out the various other losses tend to show, the loss of 48 per cent. was detected in drainage and overflow water and retained in the soil while the remaining 27 per cent. was unaccountable.

The trial of reducing the cost of manure by planting more number of seedlings and reducing the dose shows that, it is possible to reduce the dose by increasing the size of the bunch at transplanting. But this means that we are reverting to the local system of transplanting more seedlings in a bunch to effect the economy of manure. This system, however, has one advantage of not allowing the plants to lodge which is a very important factor for grain formation. This experiment, however, requires further confirmation.

Manurial experiments of rice at Karjat.—Increasing doses of sulphate of ammonia from 200, 300, 400 and 500 lbs. per acre, have given increased percentage of grain yield this year, which was due to the non-lodging crop of the season. The increased percentage of the above manure was 20, 22, 37 and 38 respectively over the no-manure crop, which was contrary to the experience of the past two years, when 300 lbs. of sulphate of ammonia per acre was recorded the highest yield. This experiment, however, need not be repeated as a dose of more than 300 lbs. of sulphate of ammonia is beyond the reach of ordinary cultivators. These experiments were also conducted in pots and the increased yields referred to above, have been corroborated.

The experiments of the sulphate of ammonia on rice crops were conducted at Palghar, Kalyan, Bhiwandi, Jambul, Bhisegaon, Bamnoti and Panwel on a large scale and in each of these places the increased yield from 25 to 104 per cent. has been recorded over the no-manure plot. The extra profit from manuring varies from Rs. 17 to 38 per-acre over the no-manure crop.

Application of the sulphate of ammonia in several stages of plant growth.—The pot experiments confirmed the findings of the previous years that manuring in three stages according to the plant needs, is

better than giving it in one or two doses. In the field experiments of this year, the results are not so corroborative on account of the peculiar season of this year, which produced moderate vegetative growth from the beginning.

With the view to minimise the dose of nitrogen experiments were arranged with 20 lbs. of nitrogen per acre in two doses, first dose of 15 lbs. supplied by the middle of August and the remaining dose at pre-flowering stage and they were compared with 50 lbs. of nitrogen given in 5 doses. From the results it will be seen that both the doses, *viz.*, 20 lbs. of nitrogen and 50 lbs. of nitrogen have given equal yields of 3,500 lbs. of grain per acre but there is a saving of Rs. 12 per acre in the former dose. The manured plots have yielded 40 per cent. more outturn than the unmanured plots. These results are very significant and could help in reducing the dose. However they require confirmation by further trials.

Manurial experiments with green leaves mentioned in paragraph 13 of the last year's report were further conducted. Green matter in the form of *rui* (*calotropis gigantea*), *Ipomea carnia* and *bhendi* (*Thespesia populnea*) and *crotalaria angyroida* on the basis of 60 lbs. of nitrogen per acre, was tried as a manure for rice. Best results are obtained by the use of *rui* leaves, next in order comes *bhendi* and the third is *Ipomea*. These results are due to the heavy quantity of green stuff required in the case of *rui* and *bhendi* which cannot be secured with less cost and trouble. Hence the experiments with *rui* and *bhendi* will be discontinued. *Ipomea* stands a great chance for its easy production in the rice field by planting its cuttings after the harvest of rice. Nearly 40 per cent of nitrogen is obtained from such vegetation per acre and if it is supplemented with 20 lbs. of sulphate of ammonia, the results are most encouraging. In the pot experiments, the effect of this combined manure was seen in 120 per cent. increase in the yield over the no-manure pot.

In paragraph 14 of the last year's report, the trial of calcium cyanamide and ammophos were compared with the sulphate of ammonia. But while conducting these experiments the important factor of toxic effect of calcium cyanamide was not taken into consideration and this manure was applied just like the sulphate of ammonia. This year some experiments were conducted in pots where the manure was applied at the time of second ploughing, so that, the toxic effect may disappear till the time of transplanting. Consequently the results of this manure are more satisfactory as the yield is increased by about 50 per cent. over the no-manure plot. These results, however, require further confirmation and experiments both on the Karjat Research Station as well as in the district have been laid out in consultation with Indo Agri, Ltd.

Manurial experiments on rice at Kumta.—The soils of Kanara are mostly granite or a combination of granite and laterite. They are acidic in quality only lime or bonemeal has got beneficial effect on rice crop. As referred in paragraph 19 of the last year's report, experiments conducted with lime, bonemeal and farm yard manure clearly show that mere addition of 4 cwt. of lime or 2 cwt. of bonemeal has increased the yield

of rice up to 18 per cent. over the no-manure plot. Application of 2 cwt. of slaked lime has also produced equally good results but the sulphate of ammonia (2 cwt. per acre) when given alone has produced poor yield. It has been observed that the sulphate of ammonia produces more leafy growth which is not desirable for the formation of grain. In Kanara the proportion of leafy growth to grain of rice crop is extremely high than that of Kolaba or Thana district and if the manures like the sulphate of ammonia be added, it is sure to affect the grain yield.

As stated above, Kumta soils are acidic and are affected by drainage conditions. Experiments conducted under springy conditions and non-springy fields (well drained low lying fields) with bonemeal and ammophos tend to show that the former increases the yield by 57 per cent. over the check plot in springy condition while the latter is more economical in well drained soils as it increases the yield by 27 per cent.

(2) Nagli

Nagli breeding.—This was continued at Hatkhamba according to the programme of the Research Committee. The nine best strains selected in the past years were sown in four replications and they have given from 15 to 40 per cent. increased yield over the local *kalperi* variety. This year four promising strains (out of nine), viz., E-31, E-82, B 11 and A 16 have been selected for introduction in the districts. B 11 is the earliest of all, while A 16 is the latest. In the coming season all the above four strains will be tried on a field scale by the Fisher's method and arrangement for propagation of their seeds will be made.

Trials of ammonium sulphate on *nagli* were most encouraging, as this manure is cheaper by 50 per cent. than the fish manure which is commonly used for this crop on coastal talukas. It is also easy for application. The dose recommended is $1\frac{1}{2}$ cwt. of sulphate of ammonia per acre, or 2 cwt. of superphosphate. Both of these manures have increased the yield by 15 per cent. over the fish manure plot.

(3) Sugarcane

Manurial experiments on sugarcane with bonemeal undi-cake, and sulphate of ammonia were continued at Kumta Farm. 200 lbs. of bonemeal in addition to 15 cart loads of farm yard manure per acre has given the best results in increasing the yield by 13 tons of cane over the farm yard manure plot. It is rather strange to note that a combination of bonemeal and sulphate of ammonia or bonemeal and undi-cake has given poor results than the bonemeal alone.

With regard to the trial of sugarcane varieties, it has been decidedly proved that Red Mauritius is superior to that of local Dasakabu and nearly half the sugarcane area in Kanara is now under the Red Mauritius. Trials of other varieties like H. M. 87, H. M. 544 and J. 213, Red Sports, etc., are still going on which may lead to the introduction of better variety. It has been observed that the cane was not matured at the time of harvest as the reading of Brix was not more than 15° and hence change in the time of planting (in December) is necessary.

(4) *Cocoanut*

The manurial experiments on cocoanut mentioned in paragraph 20 of the last year's report, were continued during the year and the same dose of manure was given to each tree. The manured trees gave an increased outturn of 47·5 per cent. on an average. The number of additional nuts received from the manured tree amounted 37 which were worth Rs. 2-4-0 while the cost of manure per tree was only Re. 0-10-0.

This experiment of manure is going on for the last 3 years and from the results the following conclusions were arrived at :—

(a) By manuring there is a stimulation in the production of female flowers.

(b) The yield of nuts per tree is increased.

(c) But there is no corresponding increase in the percentage of the setting of fruit with the stimulation in flowering.

(d) The cost of manure (annas 8 to 10 per tree) is reasonable.

Addition of common salt, tying cattle round the trees or digging and stirring the soil did not produce appreciable effect this year, as there was only a difference of 3 or 4 per cent. in the treated and untreated trees.

Dropping of immature nuts (buttons).—This observation was continued from plant to plant and it was found that the percentage of the dropping of buttons reached from 70 to 80 per cent. from the second month after opening the spodia till the end of the third month. Examination of dropped nuts showed the presence of the fungus *Diplodia* on which the spraying of Bordeaux mixture was tried without effect. But since the fungus is found in every sample, even on ripe nuts, the cause of dropping may not be exactly due to the fungus and it requires special investigation. The observation recorded in the last year's report, viz., that manuring checks the dropping of nuts to a certain extent—was also confirmed by the results of this year.

(5) *Fumigation of Betelnuts*

The difficulty of drying betelnuts, owing to inclemencies of weather and imperfect drying of produce before it is marketed, brings about mould and deteriorates the quality and thereby the price is reduced by about 25 per cent. To remove this defect, fuminating the nuts with sulphur was tried on the market samples and the effect was splendid. The mould had disappeared and the colour and gloss of the stuff were brightened. The mould did not appear at least for a month more. This process will enable the cultivator to hold out his produce when there is slump in the market. The annual export of *supari* (betelnut) from Kanara is worth more than 5 lac of rupees and the importance of this treatment will be felt when the market is flooded with *supari*.

(6) *Forest growing*

The trial of suitable plants for deforested area, mentioned in paragraph 27 of the last year's report, was in progress. Both shrubs and trees were included in the list of 50 species. The following appeared to be promising during the year :—

(1) *Crotolaria anagyroides*.—This is an annual like *Crotolaria Juncia*. But it grows quicker and produces large quantity of green matter (nearly 40,000 lbs. per acre). It responds to early pruning and puts forth large number of branches.

(2) *Tephrosia candida* is a quick growing bush lasting for three years.

(3) *Cassia siamea* (a tree).

(4) *Hardwickia binata* (a tree).

(5) *Gliricidia Maculata* (a tree).

(6) *Adhatoda Vasica* (a bush).

(7) *Grearia Mixocoe* (a bush).

An experiment of finding out the manurial value of dry dropped leaves as well as green leaves of these species was conducted on rice which tends to show that green leaves produced far better effect than the dry leaves.

(7) *Mango*

During the year under report, most of the experiments mentioned in paragraphs 25 and 26 of the last year's report, were repeated for confirmation. Careful record was maintained of the materials and labour required for treatments together with number of inflorescences treated and the results obtained to decide the best and economic remedy. Dusting experiments which gave promising results last year, were tried on a large scale. The results of all the mango work are summarised below :—

There were two flushes of flowers in January and February 1929. The first flush was very heavy but was badly attacked by jassid hoppers for nearly a month and half. These species of hoppers belong to *I. niveosparus* and *I. clypealis* which are very harmful to the blossoms. They pass from season to season by resting on stems and leaves of the mango trees, sucking sap from the mango leaves. These hoppers cause damage varying from 30 to 90 per cent. of the mango crop.

The mildew is usually bad in February and March but this year the attack was not severe. It is a form of *Erysiphe* but how it passes over from season to season is not exactly known. The damage caused by mildew varies from 10 to 40 per cent.

Of all the remedies tried this year, fish oil rosin soap was found to be most unsatisfactory. The strength of the solution was 0.75 per cent. Although the nymphs were killed by this spraying the flower heads were reinfested within a week with the fresh nymphs hatched out of eggs. When the spraying was repeated four to six times at an

interval of 6 to 10 days, the cost of spraying a fully developed tree came to Rs. 4-8-0. But when the attack was so severe this treatment had very little effect. Besides it does not serve as a remedy for mildew. This treatment therefore will have to be discontinued.

Bordeaux mixture was used in the strength of 5.5.50 and it was repeated four or five times at an interval of six to ten days. The cost of this treatment was Rs. 4 per tree. This was proved effective against mildew, both as a preventive and curative and against the jassid hoppers as a deterrent. The treated trees gave an average increase of 82 per cent. of fruit over the untreated in the first flush and 161 per cent. in the second flush. There was a clear profit of Rs. 3-9-0 per tree after defraying the expenses of the treatment when compared with the outturn of untreated trees.

Sulphur dusting was as effective as Bordeaux mixture. Three dustings were given at an interval of about a fortnight with a Pearless dust gun. The cost of this treatment was Rs. 2 per tree of moderate size. The treated trees gave an increase of 154 per cent. manured fruit over the untreated ones, in the first flush and 67 per cent. in the second flush. The average net profit was about Rs. 4 per tree when compared with the yield of untreated trees.

The mixture of sulphur and cyanide was tried as before but the proportion was 6 to 1. This mixture was very effective against hoppers and mildew. Two or three dustings at an interval of a fortnight were quite sufficient and their cost came to Rs. 3-8-0 per tree. The advantage would be seen in the increase of 387 per cent. of matured fruit from the treated trees over the untreated ones in the first flush and only 17 per cent. in the second flush when the hoppers and mildew were absent. The net profit of this treatment was Rs. 6-8-0 per tree.

Sulphur and tobacco mixture has also given hopeful results by increasing the outturn by 450 per cent. per tree in the first flush.

(8) *Onion Blight*

As reported in paragraph 33 of the last year's report, investigation on the leaf blight of onion was carried on the Kumta Farm. Resistant plants selected from the diseased crop proved failure for the last four years. Fungicides and insecticides were found ineffective to check the disease. Manurial treatments also did not improve the condition. Some varieties were brought from other parts of the Presidency but none of them proved successful except the Goa-Red which was somewhat hardy. The problem of onion blight is still not solved and a detailed investigation is necessary to tackle this disease which affects the onion cultivation of over 500 acres in Kanara District.

(9) *Synthetic Manure*

The experiments of rotting various kinds of leaves and trash mentioned in paragraphs 28 to 32 in the last year's report, were continued during this year and most of the conclusions of the last year were confirmed.

Studies in the present method of preparing farm yard manure revealed that there were many defects in the present methods and many of the manurial ingredients are washed away in the storage particularly in the monsoon. It was found that if a shelter is provided over the manure heap to protect it from the hot sun and rains, the manure becomes rich in nitrogen and well decayed. The addition of dung and urine daily received from the cattle byre and stirring and moistening the heap occasionally in hot weather, help the rotting of fibres and the manure becomes ready for application in a short period.

The manures prepared by the synthetic method, i.e., by the addition of 5 per cent. of lime or 0.1 per cent. of the sulphate of ammonia, were applied to rice crop which has given 17 per cent. of the increased yield over the plot of farm yard manure prepared by the local method. Preparation of the synthetic manure on a large scale has now been undertaken and the results will be available in the next season.

Other chemicals like calcium cyanimide, bone dust, tank silt, Adco accilerates and Adco mixture were tried for preparing the synthetic manures but they were found to be too costly or not so efficient as sulphate of ammonia or lime.

(10) *Crabs*

The work mentioned in paragraph 34 of the last year's report, was continued. Trials of poisoning the water of the burrow so as to make it uninhabitable for crabs, were conducted with the following poisons :—

- (1) Paris green, (2) sodium arsenate, (3) kerosine, (4) washing soda, (5) potassium cyanide and (6) copper sulphate.

The results are given below :—

Paris green is soluble in water and did not give satisfactory results. Sodium arsenate is quite effective and a dose of 0.1 per cent. is sufficient to kill the crab. Kerosine is not mixed with water and hence not effective. Washing soda although soluble in water had not given satisfactory results. Potassium cyanide was found very effective as it served both the purposes of poisoning the water as well as of producing cyano gas. A dose of 0.1 per cent. solution was found effective although it takes little longer time to kill the crab. Copper sulphate is equally effective but a stronger dose 0.5 per cent. is required.

The experiment of fumigating the air in the burrow was tried with carbon bisulphide, calcium cyanide and seeky oil fumigants and all of them were found very effective and the doses varied from 0.7 to 1.5 grams in 1,500 c.c.s of water. But the important factor of ascertaining the volume of each burrow and its water contents is still to be solved so that a combination of water poison and fumigants can be tried in different burrows of the field. Further investigations are necessary to tackle this problem.

(11) *Storage Pest of Rice*

While introducing *kolamba* strain No. 79 in Thana and Ratnagiri districts, complaints were received about the bad attack of

storage pest to this variety. To ascertain this fact and to determine the degree of damage in different varieties, clean samples were kept in earthen pots open to infestation. At the end of the season the following loss was ascertained :—

Name of variety		Percent of loss due to store pest	
Kolamba No. 79	.. ..	17·29	per cent.
Patni Local	.. ..	6·5	
Kudai No. 42	.. ..	7·9	
Kudai No. 25	.. ..	3·75	
Waksal Local	.. ..	6·9	
Panwel No. 61	.. ..	3·6	

From the above figures it will be seen that the public are justified in complaining against Kolamba No. 79.

Preventive measures were adopted by using receptacles which will prevent the attack as well as by using substances to ward off the insects. Out of the receptacles, gunny bags, *mudha* (made of paddy straw), and *ranjan* (big earthen jar) were found to be unsuitable, while insect attack in *kananga* (bamboo bin plastered with cowdung), kerosine tins and iron bins, was very small from 1 to 1·5 per cent. Among the preventive substances ash mixed with paddy is found very effective as the damage was less than 2 per cent. Among the fumigants carbon bisulphide and calcium cyanide were effective but a small amount of damage did exist in these fumigated seeds probably due to the presence of larvæ inside the grains. This is the first year of the experiment which requires confirmation.

(12) Crop Pests

The following pests were studied during the year :—

(1) *Schænobius bipunctifer*.—This caterpillar was found in *vangan* (rabi) rice which had attacked nearly 50 per cent. of the plants on the Ratnagiri Farm. The light trap was not found very effective to catch the moths.

(2) *Nymphula depunctalis*.—This caterpillar prepares a case of rice leaf by cutting it inside and feeds upon the leaves. It can float upon water and moves from plant to plant. This pest could not be brought under check by putting kerosine and Paris green in water or by light trap. The *vangan* crop was very badly affected by this pest.

(3) *Termites*.—These were found on mango gardens, feeding upon the bark. Trials of destroying the queen ants with 1 per cent. solution of crude oil emulsion or 5 per cent. solution of undi-cake, poured in the nests, were found very effective.

(13) *New Problems*

Before proceeding to the next chapter, it will not be out of place if I make a mention of the problems of the Konkan Division that are still to be solved :—

(1) Finding out the economical dose of the sulphate of ammonia for a rice crop of the trap soil.

(2) To find out a strain of rice to replace the *bhadas* variety of salt lands.

(3) To find out a late strain of rice to replace *varangal* of Ratnagiri District.

(4) Trials of new manures like the ammophos, calcium cyanimide, etc., on rice.

(5) To find out early, late and intermediate types of rice strains to replace the local varieties of the coastal tracts of the Konkan Division.

(6) To find out the best manure for *supari* (Betelnut).

(7) Onion leaf blight in Kanara District.

(8) Destruction of crabs.

(9) Manat land improvement.

(10) Harik (kodra) breeding work.

(11) Improvement of *varkas* lands.

(12) Destruction of kanne fly on rice.

(13) Commerical use of cashewnut fruit in Ratnagiri District.

(14) To find out the sugarcane varieties for Kanara District.

(15) To investigate the disease of betelvines in Bassein Taluka.

(16) Mosaic disease on chillies, etc.

(17) Dropping of immature nuts of cocoanut and betelnuts.

(18) Eradication of *Mimosa pudica* and *Lantana* in Kanara District.

II.—Propaganda

The principal items of the programme of the District Staff were as under :—

(1) *Introduction of improved and high yielding rice strains.*—The introduction of *kolamba* No. 42 was continued in the Thana and Kolaba districts and the total quantity of rice distributed during the year was 118,717 lbs. which was sufficient for 3,300 acres. The distribution of this seed is going on in this tract for the last five years and it has spread over a large area. The method of introducing the seed, followed till this year was as follows :—

The Department used to supply the purest seed from the Karjat Farm to some selected cultivators free of cost on condition that they should allow the Department to purify their standing crop. When the seed was ready the Department used to purchase it from the Personal Ledger Account of the Director of Agriculture and store the same in different tracts for four or five months. This stock was supplied to general cultivators on credit after adding all the cost of carting, storage, shrinkage and labour required for distribution. Naturally the selling rate was about 25 per cent. higher than the market

rate. The drawback of this system was seen in the higher price at which it is supplied to cultivators and also in the enormous amount of trouble required to be taken both by the officers of the Agricultural and Revenue Departments for the recovery of the sale proceeds. Most of the energy and attention were devoted to the recovery business and the legitimate agricultural work was set aside.

To remove the defects of this system a new scheme has been brought into force. Each district of the Konkan Division is divided into 3 parts representing early, intermediate and late types of rice crop suitable to that tract and all the available seed of the Department will be given to some registered seed growers at half the market price on condition that they will propagate the seed in the best possible way and allow the Departmental staff to remove the rogues. These seed growers will preserve their own seed and distribute the same to their tenants and other cultivators at any price which they can command. Ten registered seed growers from each taluka are to be selected every year and they will be changed from year to year. Advantage of the existing Taluka Development Associations and Seed Societies will be taken in stocking and distributing the seed. By this system there will be a continuous link of the supply of pure seed of the Karjat Farm to the registered seed growers and a general seed distribution to mob cultivators.

Kolamba strain No. 79 was much appreciated in the northern part of the Thana and Ratnagiri districts and also in Surat and Navsari districts. In all 5,700 lbs. of this seed was distributed, which was sufficient for 150 acres. The complaint about the store pest to this variety is reported above.

In addition to the above two varieties, seeds of the following strains have been distributed in the tract mentioned below :—

Kolamba strain No. 184 in north Thana District.

Do. No. 226 in Palghar Taluka.

Kudai No. 42 in south Ratnagiri.

Kudai No. 25 in the north and south Ratnagiri.

Panwel No. 61 in south Ratnagiri.

All these strains have given 15 to 20 per cent. more yield over the local check on Karjat and Ratnagiri farms.

In Kanara District the two varieties of Halga and Maskati rice selected from mass selection, were further pushed on. About 20,000 lbs. of Halga and 4,000 lbs. of Maskati seed were distributed during the year under report through the Taluka Development Associations of Kanara and the Agricultural Requisite Supply Society of Siddapur. These varieties have given more yield than the local rice but there are good many variations in their character due to the mass selection.

Improved *nagli* strains.—700 lbs. of the improved *nagli* strain Nos. A16, B11, E31 and E32 were distributed in Thana, Kolaba, and Ratnagiri districts during this year. From the comparative trials

of these strains and the local *kalperi* variety in the Ratnagiri District, it was observed that these strains have given 20 per cent. more yield over the local and the demand for seed is steadily increasing and to satisfy the same, a system of registered seed growers will have to be introduced.

(3) *Introduction of other crops.*—Introduction of sugarcane varieties like H. M. 84, H. M. 544, and J 213 is being done in Kanara District. In Siddapur taluka H. M. 544 is getting popular and 4300 sets newly brought from Baramati have been introduced in this taluka. The local variety of Dasakabbu is being rapidly replaced by red Mauritius. Malbar variety of pepper was found more advantageous in the betelnut gardens of Kanara and hence 16,000 cuttings of this variety have been specially brought from Malbar and introduced in this district. Onion seed from Nasik was supplied to the cultivators of Kanara and Ratnagiri districts and the crop gave a fair outturn although it was attacked by the leaf blight. The cultivation of Spanish peanut on *varkas* lands has received a set back on account of the trouble of wild animals and new attempts are being made to introduce it as a *rabi* crop in low-lying fields of rice with proper precautions. The new varieties of pine-apples have been introduced in Thana and Kolaba districts as a catch crop.

(4) *Manures.*—The use of the sulphate of ammonia as a *rab* substitute became more popular this year in Thana and Kolaba districts and more than 12 tons of this manure was sold for this purpose. This method was demonstrated in 70 new places in Thana, Kolaba and Ratnagiri districts. The use of the sulphate of ammonia as a field manure has taken a firm root in Thana, Kolaba and Ratnagiri districts and private companies have opened nearly 20 depôts in these districts to supply this manure. Sixty-five tons of sulphate of ammonia were sold for field manure during the year. In Ratnagiri District this manure was found very profitable for *nagli* crop and eight tons of this stuff were consumed for *nagli* crop. A dose of $1\frac{1}{2}$ cwt. per acre was found quite effective. The net profits from the manured crop of rice and *nagli* varied from Rs. 16 to 20 and Rs. 7 to 10 per acre respectively over the no-manure plots.

In the stiff black soils of the north Konkan and the granite and laterite soils of Kanara, superphosphate and bonemeal were found more economical for rice crop and eight tons of this stuff were distributed during the year. When the crop was manured at the rate of 2 cwt. per acre the increase of yield varied from 15 to 20 per cent. over the no-manure crop.

For the garden crops of Thana and Kolaba districts, a mixture of castor cake, sulphate of ammonia and bonemeal was found very profitable and manure sufficient for 250 acres of garden land was supplied during the year. This manure was very effective when the garden crops are grown by the ridge and furrow system instead of in flat beds and this method has been adopted by most of the cultivators of the north Thana District.

During the year under report, systematic experiments of calcium cynimide and ammophos have been laid out in twenty places in co-operation with Indo Agri Ltd., of Bombay.

During the year special attempt was made to demonstrate the manufacture of poudrette at Pen and Roha with the help of the local municipalities. The valuable night soil was uptil now thrown in the creek although the manure is scarce all over Konkan. If this trial succeeds all the municipalities will follow the example.

(5) *Implement and Machinery.*—During the year under report, 17 iron mills, 6 Poona pans, 2 power crushers and 19 Meston ploughs and 10 Bulsar rahats were introduced in the Kanara District. In the remaining part of Konkan, the progress was very slow, as only 10 Meston ploughs and 4 Bulsar rahats and 3 pumping plants were erected. The Planet Junior hand and bullock cultivator has become popular in the Thana district but Meston plough was considered as a heavy implement for Konkan bullocks.

(6) *Koleroga spraying.*—Every possible attempt was made to make the spraying popular by conducting the operations in 45 villages, covering more than 300 acres of *supari* gardens in Kanara. There were 12 training classes and 28 demonstration plots during the year. In the coming season an extensive scheme is laid out to cover more than 500 acres with the additional staff and facilities. Last year a sum of Rs. 500 was advanced from tagai in 3 villages for spraying operations. The spraying material was supplied by the Agricultural Requisite Supply Society organised at Siddapur and by the Taluka Development Association of Sirsi. In all material worth Rs. 800 and 12 hand sprayers were sold during the year.

This spraying has also taken a firm root in the Dapoli taluka of Ratnagiri District and people of Asud, Kumbha, Anjarle, Murdi, etc., are regularly spraying their *supari* gardens.

(7) *Breeding bulls.*—There are 5 Premium bulls kept at Killar, Mulund, Maroli, Umbergaon and Saphala in Konkan division and they are doing very useful service to the village cattle. The buffalo bull kept at Kumta Farm has served nearly 1,000 animals during the past years. It was disposed of during the year as it had gone very old. The Sindhi bull kept on this farm is too big for small cows of Kanara. The buffalo of the Ratnagiri Farm has served 129 animals during the year.

(8) *Denaturalised salt.*—During the year licenses for 3,969 maunds of denaturalised salt were issued against 3,707 maunds of the previous year. It is gratifying to note that the Salt Department has reduced the cost of this salt from annas 14 to annas 10 per maund this year.

(9) *Crop tests.*—During the year, the District Staff and other graduates took 12 crop tests—10 on rice and one on *nagli* and *niger*-seed each.

(10) *Gul-making.*—Demonstration of preparing solid gul was continued at Killar and Haignod and Keravati in the Kanara District but the chief difficulty was found in the low Brix of juice and immature

cane. The percentage of fibre was rather too high and unless these defects were removed, better quality of gul could not be expected. At Killar Mr. Ganesh Ram Hegde has purchased one centrifugal machine for preparing sugar by Hodi's process but for want of an expert, the attempt had to be postponed till coming season. In the interior of Kanara sugar is sold at a dear rate and if the liquid gul, which is just like a syrup, be utilised for sugar making, it is possible to make it a profitable concern in up-ghat tracts of Kanara.

(11) *Survey of grass areas in Palghar Taluka.*—The idea of shifting all the milch cattle from Bombay to some nearest centre of grass areas and organising a dairy district is under contemplation for a long time but this matter received stimulus by the address of His Excellency the Governor of Bombay at the time of the opening ceremony of the Presidency Agricultural Show at Ahmedabad. Palghar Taluka is famous for its grass areas but no definite data of the availability of grass and other facilities such as supply of water, vicinity of railway lines, etc., was available. A special graduate has been appointed to collect this data, and the work is still in progress. If the Dairy District be organised, it will do an immense benefit to the people of Bombay and save slaughter of nearly 20,000 best milk cattle and an equal number of heifers annually.

(12) *Silageage experiment.*—Experiment of silageage was made at Hatkhamba Farm in the pucca silo constructed there. 17,500 lbs. of green grass was filled in this silo in October 1928 and the silage was utilised in March and April 1929 and about 11,000 lbs. of good silage obtained from the same. The silage was given to the milch cattle of Hatkhamba and Ratnagiri to convince the people its advantages and it will be seen how far people can adopt the same. *Kacha* siloes were demonstrated at Killar in Kanara and at Alewadi in Thana District, but in both of these places the percentage of shrinkage and wastage was rather high.

(13) *Shows and demonstrations.*—During the year the Presidency Agricultural Show was organised at Ahmedabad and all the districts of Konkan especially the Thana District took a leading part in contributing a large number of exhibits and money for the success of this Show. A big Fruit Show was organised at Ratnagiri in the month of May 1929 which was attended by more than 5,000 people. It was opened by the Director of Agriculture and his opening address was highly appreciated throughout the Presidency. More than 1,000 exhibits of different fruit were received in the Show and the Department laid special stress in the demonstration of grading, packing, canning and marketing of mangoes which was very effective. The lectures on different subjects were interesting and aroused enthusiasm among the fruit growers. The prizes, in the form of gold and silver medals amounting to Rs. 400 were distributed by the Collector of Ratnagiri. This Show had a marked effect in starting the grading and packing of mangoes in four places in Ratnagiri with the help of the co-operative societies. The

Ratnagiri District exports to Bombay about one lac of baskets of the famous Alfanso mango worth more than 12 lacs of rupees and it will give a clear idea of the importance of fruit show in this district.

In Konkan there is a better scope for canning of fruit especially when the steamer communication is stopped. If the neglected fruit of *jamul* and *karavand* be utilised for preparing syrup it will add to the wealth of this district. With this object in view a class of canning of fruit was organised in three places of this district and nearly 75 people attended the same.

The District Staff arranged 228 demonstration plots on the cultivators' fields for manurial and varietal trials and managed nine big demonstrations of all the agricultural improvements and delivered thirty-five lectures with the help of magic lantern slides.

(14) *Remedies against the mango hoppers and mildew.*—With the object of comparing the results of the mango investigation work of the Ratnagiri Farm, trials of spraying and dusting mango inflorescence were arranged in four gardens at Ratnagiri, Malvan, Dapoli and Panchnodi of the Ratnagiri District and in three gardens at Borivali, Vileparle and Palghar of the Thana District. The spraying with fish oil, rosin soap was not so effective but the dusting with sulphur and cyanide mixture was much appreciated as it would save 50 per cent. of the loss caused by the hoppers and mildew. The treatment had marked effect at Panchnodi and Palghar.

(15) *Publications.*—During the year 82 articles on agricultural subjects were contributed to the Agricultural College Magazine and *Shetaki* and *Shetakari*. A few articles were also sent to the Kanarese Magazine *Vakaltanu* and *Vakaltanu*. A special Pusa Memoir on "Studies in the shedding of mango flowers and fruits" was published in which the work of the first two years of the Ratnagiri Farm was given.

The following leaflets were published during the year :—

- (1) Leaflet No. 5 of 1928. An excellent Rice Variety (Kolamba No. 42). What it is and where to get it.
- (2) Leaflet on Pig Proof wire fence.
- (3) Rab Substitute and Supplements (Revision of leaflet No. 4 of 1916).
- (4) Memoir of Nagli Breeding Work.
- (5) Bulletin on "Studies on Rice and Rice Cultivation".

III.—Agricultural Organization

(1) *Divisional Board of Agriculture.*—During the year there were three quarterly meetings of the Konkan Divisional Board. The Deputy Director presided over one meeting while the Assistant Registrar of Belgaum Division presided over the remaining two. The Board controlled and directed the work of the propaganda staff of the Agricultural and Co-operative Departments and Taluka Development Associations.

(2) *Taluka Development Associations.*—There were ten associations registered previously to which the Malvan Association was added during the year. Each district of the Konkan Division now represents the following associations :—

1. Thana District .. Mahim, Dahanu and Umbergaon.
2. Kolaba District .. Roha.
3. Ratnagiri District .. Dapoli, Ratnagiri, Rajapur and Malvan.
4. Kanara District .. Sirsi and Karwar.

Out of these associations, Mahim and Rajapur are doing substantial work in agricultural improvement and can be classed as first class. The remaining associations except the Kalyan and Ratnagiri have done a fair amount of work and can be placed in the second class. Kalyan and Ratnagiri are in a dormant condition for want of funds and very little work is turned out by them. The work of organizing new associations at Chiplun, Panwel and Pen is in progress.

(3) *Co-ordination with Revenue and Agricultural Departments.*—All the District Staff had a joint tour with the Mamlatdars to introduce the agricultural improvements in the districts. Co-ordination meetings were held with the help of the Assistant Collectors and District Deputy Collectors who has rendered all possible help for arranging the demonstrations. In all 12 big and 28 small meetings were held in this Division in collaboration with the Revenue Officers. The Deputy Director of Agriculture had paid several visits to all the Collectors of the Konkan Division and supplied them full information about the activities of the Department. The Honourable Minister of Agriculture paid visits to Palghar and Mahad talukas and inspected the agricultural work during the year.

(4) *Non-credit co-operative work.*—There are 29 non-credit societies in the Konkan Division besides the 12 Taluka Development Associations. During the year, Panwel Paddy Sale Society and the Moradpur Jungle Preserving Society were newly started by the District Staff. The organization of starting an Irrigation Society at Panwel, Paddy Sale Society at Dipavali and Fencing Society at Islu, is in progress.

There is one Mango Sale Society at Ratnagiri for arranging the sale of mangoes of the Ratnagiri District but it had done no work during the year ; neither it had got the desire to co-operate with other workers. The work of grading, packing and marketing was therefore required to be done with the help of the Mirjola Co-operative Credit Society which has taken an active part in this matter. This Society has arranged to classify the mangoes of the members according to the grades and had despatched them to Bombay in special packages. In all 50 baskets and 50 boxes of the graded fruit were despatched.

Two lots of mangoes were sent to Bombay, one as graded and the other as ungraded. The following results are worth noting :—

- (1) Ungraded.—5 boxes and 15 baskets containing in all 1,500 fruit were sent and the price realised is Rs. 123.

(2) 1,500 fruit of the same trees were classed into the following grades and they realised the prices given below :—

I grade	390	mangoes	realised Rs. 43
II grade	500	mangoes	realised Rs. 48
III grade	610	mangoes	realised Rs. 50
Total .. 1,500			Rs. 141

Thus it will be clearly seen that the graded mangoes fetched Rs. 18 more than the ungraded. From the general observation it was seen that a box containing 60 fruit of the first grade fetches Rs. 2 more than that of the ungraded one and if the fruits had got the reddish gloss on the surfaces they realised Rs. 3 more per box than the ungraded one. During the year this Society had sold mangoes worth Rs. 1,850 even if the sale was undertaken late in the season.

IV.—Agricultural Services

(1) *Boring work.*—There are seven boring machines in this division, one of which is a Calyx drill. All of them are worked with oil engines. The total number of bores undertaken during the year was 58 as compared with 34 of the previous year. Out of these 34 bores were successful, 19 unsuccessful and 5 are still in progress. The total footage of bores was 4,482 feet as against 2,829 feet of the previous year. The Calyx drill is much appreciated by the public as it can bore the hardest rock. The demand for boring machines in Thana District is so great that some of the five years' old applicants could not get their turn during this year and about 25 applicants had to be refused this year. From the observations of boring it is noted that in some tracts like Borivali and Kandivali sufficient water could not be tapped even if the bore has gone to 200 feet from the surface and it is more desirable to reject the application from such tracts instead of wasting the time and energy of the Department as well as of the public.

During the year under report a special boring experiment was made at Akshi in the Alibag Taluka, to find out whether sweet water can be tapped below the salt water strata on the sea coast. In the beginning $4\frac{1}{2}$ inches bore was taken and at a depth of 45 feet it was reduced to 3 inches. A layer of 12 feet from the surface was composed of pure sand. Below the same there was 42 feet of sticky mud ; then commenced a layer of quartz to a depth of 8 feet and below that there was a hard trap rock till 200 feet from the surface. There was a small quantity of sweet water in the layer of mud but down below no trace of sweet water was found.

By getting weekly reports directly from the Boring Mukadams, better check was enforced, which resulted in an increased output of work. At the same time I must make a special mention of the work of the Acting Boring Assistant, Mr. N. B. Limaye who has spared no pains in bringing the work up to the mark.

The statement of detailed information regarding the boring work prescribed in G.R. No. 7075, R.D., dated 5th May 1923, is appended herewith.

(2) *Elephant Shikaries*.—The work of killing elephant was carried in Honawar, Sirsi and Halyal talukas of the Kanara District with the help of Shikaries. The Halyal shikari had killed six elephants while the Sirsi man killed three during the year. Report of damage by elephants was received on the borders of Honawar and Siddapur talukas but no elephant could be traced. During the year new powerful cartridges were supplied to these Shikaries from England. The trouble of wild pigs and jackals was common throughout this division and people are demanding organised Shikari parties like those of the Deccan.

V.—Agricultural Education

Vernacular Agricultural School at Jambul.—During the year under report there were constant changes in the staff of the school which affected the efficiency of the teaching work. There were 8 students in the first year. The result of the examination held in April 1929 is given below :—

Class	Number of students who appeared for the examination	Number of students who passed the examination
First year	12	8
Second year	8	8

The examiners have specially remarked to emphasise the necessity of practical training in agriculture to the students. This school is situated in a malarious climate and hence a special care is required to be taken for the health of the boys. This fact also affects the attendance of the school.

PERSONAL

During the year all the staff of the Konkan Division had to put in strenuous work on account of the increased activities. The research work of Mr. P. V. Wagle deserves special mention as he has shown special aptitude for investigation work.

V. V. GADGIL,
Deputy Director of Agriculture,
Konkan Division.

Annual report of boring work done during the year

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore	Water before boring in gallons per hour
THANA DISTRICT						
<i>Machine No. 2, Calyx drill</i>						
1	Mr. M. S. Captin ..	S. Salsette ..	Andheri ..	5"	100'	Nil ..
2	Do. ..	Do. ..	Do. ..	5"	100'	Nil ..
3	Mr. B. S. Dandekar ..	Do. ..	Borivli ..	5"	3'	Surface ..
4	Do. ..	Do. ..	Do. ..	5"	81'	Nil ..
5	Do. ..	Do. ..	Do. ..	5"	150'	Nil ..
6	Mr. M. J. Gazdar ..	Do. ..	Kandivli ..	5"	170'	400
7	Do. ..	Do. ..	Do. ..	5"	52'	40
8	Mr. R. N. Mehta ..	Do. ..	Vile Parle ..	5"	50'	Surface ..
9	Mr. D. R. Joshi ..	Do. ..	Do. ..	5"	48'	Do. ..
<i>Machine No. 15, Musto Patent</i>						
10	Mr. B. S. Dandekar ..	S. Salsette ..	Borivli ..	4"	163'	Nil ..
11	Rao Bahadur Y. H. Desai ..	Do. ..	Do. ..	4"	115'	350
12	Do. ..	Do. ..	Do. ..	4"	75'	400
13	Mr. B. S. Dandekar ..	Do. ..	Do. ..	4"	70'	Nil ..
14	Mr. Ranchhoddas Valabhai ..	Do. ..	Malad ..	4"	72'-6"	100
15	Mr. J. R. Dubhash ..	Do. ..	Jogeshwari ..	4"	50'	Nil ..
<i>Machine No. 46, Musto Patent</i>						
16	Mr. Hakimuddin Katabbhai ..	Palghar ..	Palghar ..	4"	65'	Surface ..
17	Mr. N. B. Tuehekra ..	Do. ..	Shirgaon ..	4"	120'	100
18	Do. ..	Do. ..	Do. ..	4"	57'	200
19	Mr. Bala Jagu Vartak ..	Do. ..	Mahjra ..	4"	70'	350
20	Do. ..	Do. ..	Do. ..	4"	92'	250
<i>Machine No. 16, Musto Patent</i>						
21	Mr. H. K. Irani ..	Dahanu ..	Dahanu Road	4"	125'	400
22	Do. ..	Do. ..	Do. ..	4"	77'	400
23	Do. ..	Do. ..	Do. ..	4"	50'	600
24	Mr. K. N. Irani ..	Do. ..	Do. ..	4"	75'	600
25	Do. ..	Do. ..	Do. ..	4"	52'	900

1928-29 ending 30th June 1929 in the Konkan Division

Water after boring in gallons per hour	Departmental charges	Labour charges incurred by the owner	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
100	55 1 0	209 0 0	354 1 0	2 3 2	Not yet decided	This year much better work is done by the Calyx machine as it was thoroughly overhauled and repaired last year.
125	36 1 0	181 5 0	217 6 0	1 5 9		
Nil	0 9 0	32 0 0	32 9 0	10 11 0	Abandoned due to Technical difficulties.	
Nil	23 2 6	143 8 0	166 10 6	2 0 10	Abandoned owing to the tools remaining in the bore.	
100	30 11 6	211 2 0	243 13 6	1 9 8	Unsuccessful.	
125	20 3 0	106 4 0	126 7 0	1 1 8	Do.	
600	60 0 0	36 0 0	96 6 0	1 13 11	Successful.	
200	57 0 0	124 12 0	181 12 0	3 10 2	Do.	
..	..	..	..	..	In progress.	
Nil	68 40 0	216 0 0	284 10 0	1 12 0	Unsuccessful ..	Work done in previous years, 103'-6". It has been observed that the strata on the east of the B. B. & C. I. Railway is very hard with little possibility of getting water. Hence the progress of this machine is much less than can be expected of such power machines.
400	37 12 6	105 0 0	142 12 0	1 3 10	Do. ..	
600	97 8 0	82 0 0	179 8 0	2 6 6	Successful ..	
100	6 0 3	135 0 0	141 0 3	2 0 3	Unsuccessful ..	
300	123 8 2	204 0 0	327 8 2	4 7 10	Successful ..	
Not tested.	Bill	not yet made.			Stopped by the owner.	
250	78 12 0	137 0 0	215 12 0	3 5 0	Successful ..	The progress of this machine is very slow owing to break downs to the engine and machine and hard nature of rock round about Palghar.
300	256 2 3	223 0 0	479 2 3	3 15 10	Do. ..	
Salt water.	180 10 0	136 15 0	326 9 0	5 11 8	Unsuccessful ..	
600	115 2 3	135 10 0	250 12 3	3 9 4	Successful ..	
..	..	..	..	..	In progress.	
400	26 12 5	200 0 0	226 12 5	1 13 0	Unsuccessful ..	The work done by this machine is very good, as most of the bores were on the west of the B. B. & C. I. Railway where the strata is not as hard as on the east and bears very good water veins.
1,800	102 8 3	64 0 0	166 8 3	2 2 9	Successful.	
2,000	57 8 0	46 8 0	104 0 0	2 1 3	Do.	
2,000	101 14 0	60 0 0	161 14 0	2 2 6	Do.	
1,500	58 14 0	26 0 0	84 14 0	1 10 1	Do.	

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore	Water before boring in gallons per hour
THANA DISTRICT—contd.						
<i>Machine No. 16, Musto Patent—contd.</i>						
26	Mr. K. N. Irani ..	Dahanu	Dahanu Road.	4"	107'	1,200
27	Do. ..	Do. ..	Do. ..	4"	70'	1,200
28	Do. ..	Do. ..	Do. ..	4"	50'	1,400
29	Do. ..	Do. ..	Do. ..	4"	125'	800
30	Do. ..	Do. ..	Do. ..	4"	80'	1,200
31	Do. ..	Do. ..	Do. ..	4"	109'	1,000
32	Mrs. Shirinbai C. Unwala ..	Umbergaon ..	Umbergaon Road.	4"	75'	1,000
33	Mr. V. K. Sanjanwala ..	Do. ..	Kari ..	4"	65'	1,000
34	Mr. M. L. Raut ..	Dahanu ..	Aswal ..	4"	123'	1,500
KOLABA DISTRICT						
<i>Machine No. 6, Musto Patent</i>						
35	Mr. M. R. Penkar ..	Pen ..	Pen ..	4"	40'	Surface ..
36	Do. ..	Do. ..	Antora ..	4"	64'	Do. ..
37	Mr. L. R. Paranjape ..	Do. ..	Pen ..	4"	63'	Do. ..
38	Mr. T. U. Varagi ..	Do. ..	Do. ..	4"	63'	Do. ..
39	Mr. H. M. Tilak ..	Do. ..	Do. ..	4"	110'	Do. ..
40	Mr. G. G. Karkhanis ..	Do. ..	Do. ..	4"	50'	Do. ..
41	Mr. V. K. Dongre ..	Alibag ..	Akshi ..	4 1/2" and then 3"	192'	Do. ..
42	Mr. R. B. Chikhalkar ..	Do. ..	Bandhan ..	4"	91'-6"	Do. ..
43	Do. ..	Do. ..	Do. ..	4"	9'	Do. ..
44	Do. ..	Do. ..	Do. ..	4"	55'	Do. ..
45	Mr. D. S. Haldavankar ..	Do. ..	Do. ..	4"	31'	Nil
<i>Machine No. 20, Musto Patent.</i>						
46	Mr. Jagannath Mehta ..	Mahad ..	Mahad ..	4"	75'	Surface ..
47	Mr. H. K. Jummal ..	Do. ..	Do. ..	4"	66'	Nil ..
48	Mr. D. B. Gandhi ..	Do. ..	Do. ..	4"	50'	Surface ..
49	Mr. Chhagan Govardhan ..	Do. ..	Do. ..	4"	70'	Nil ..
50	The President, Mahad Municipality.	Do. ..	Do. ..	4"	40'	Surface ..
51	Mr. Harivan Hirjishet ..	Do. ..	Do. ..	4"	45'	Do. ..

Water after boring in gallons per hour	Depart- mental charges	Labour charges incurred by the owner	Total cost of boring	Cost per foot	Result success- ful or unsuccessful	General Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
2,000	183 6 6	86 0 0	269 6 6	2 8 4	Successful.	
2,500	114 12 0	91 0 0	205 12 0	2 15 0	Do.	
2,000	58 2 3	37 8 0	95 10 3	1 14 7	Do.	
1,600	191 14 6	107 8 0	299 6 6	2 6 4	Do.	
2,500	108 4 3	73 2 0	181 6 3	2 4 4	Do.	
2,500	154 0 3	106 10 0	260 10 3	2 6 3	Do.	
2,000	98 5 3	106 8 0	199 13 3	2 10 8	Do.	
1,200	84 7 0	107 14 0	192 5 0	2 15 4	Do.	
1,500	Bill	not yet made.			Unsuccessful.	
200	40 0 0	60 0 0	100 0 0	2 8 0	Successful	Much better work is done by this machine this year as the work was concentrated in due place and strata also was not very hard as in previous years.
200	71 0 0	95 8 0	166 8 0	2 9 8	Do.	
200	69 8 9	97 0 0	166 8 0	2 10 3	Do.	
200	78 0 0	104 0 0	177 0 0	2 11 8	Do.	
200	141 8 3	232 12 0	374 4 0	3 6 5	Do.	
200	52 13 3	159 0 0	211 13 3	4 3 10	Do.	
Salt water.	Nil	167 4 0	167 4 0	0 14 0	Unsuccessful	Experimental bore.
100	113 12 0	88 8 0	202 4 0	2 3 5	Do.	
Nil	..	17 8 0	..	1 15 1	Abandoned owing to technical difficulties.	
240	57 8 6	46 8 0	104 0 0	1 14 3	Successful.	
....	....	....	....	....	In progress.	
200	39 0 3	110 8 0	199 8 3	2 10 7	Successful	The machine was idle for nearly six months up to December for want of applicants. The strata at Mahad is very hard and hence the progress is a bit slow.
200	66 12 0	120 10 0	187 6 0	2 13 5	Do.	
200	39 6 0	62 0 0	151 6 0	3 0 5	Do.	
100	98 15 3	99 8 0	198 7 3	2 13 4	Unsuccessful.	
250	60 1 0	63 12 0	123 13 0	3 1 6	Successful.	
..	..	..	..	..	In progress.	

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore	Water before boring in gallons per hour
KANARA DISTRICT.						
<i>Machine No. 21, Muto Patent.</i>						
52	The Executive Engineer, Kanara.	Sirsi	Sirsi	4"	145'	Surface
53	Do.	Do.	Do.	4"	135'	Do.
54	The President, Sirsi Municipality.	Do.	Do.	4"	118'-3"	Do.
56	The Divisional Forest Officer, W. D., Kanara.	Karwar	Kandra	4"	30'-2"	Do.
58	Do.	Do.	Do.	4"	75'	Do.
<i>Tripped Works.</i>						
67	Mr. V. N. Limaye	Pen	Pen	3"	30'	Nil
68	Mr. J. V. Damdekar	Palghar	Palghar	3"	35'	100

Water after boring in gallons per hour	Departmental charges	Labour charges incurred by the owner	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
200	245 4 3	423 13 0	668 1 3	4 0 10	Successful	The strata in the upghat talukas is soft and hence the progress till January 1929 was fair. In January the machine was shifted to coastal side where granite is invariably met with in Kanara and hence better progress is not possible.
..	108 8 3	319 9 0	519 1 3	3 12 10	Do.	
..	180 12 3	353 8 0	534 2 3	4 8 2	Do.	
NH	20 10 0	312 0 0	332 10 0	11 0 5	Abandoned owing to technical difficulties.	
..	..	..	..	..	In progress.	
NH	15 0 0	15 0 0	30 0 0	2 0 0	Unsuccessful	This year much demand for tripod work was not received as in the previous year.
100	17 8 0	70 0 0	87 8 0	2 8 0	Do.	

APPENDIX H

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR
OF AGRICULTURE, SIND, OF THE YEAR 1928-29

Organization and Finance.—The present staff of the Department excluding that engaged on the post Barrage problems at Sakrand consists of :—

- 1 Deputy Director of Agriculture.
- 1 Divisional Superintendent of Agriculture.
- 1 Cotton Breeder.
- 15 Graduate Assistants of Upper Subordinate Service.
- 19 Non-Graduate Assistants of Lower Subordinate Service.
- 8 Clerks, Ministerial Service.
- 6 Mechanical Assistants including a Fitter and 4 Engine Drivers.

2. I continued to act as Deputy Director of Agriculture throughout the year. The post of the Divisional Superintendent of Agriculture filled by Mr. Lokeram as a temporary measure, from 4th October 1927 was in his charge throughout the year under report.

Mr. Alimahomed Ulvi remained in charge of Sukkur Farm till 31st August 1928 whence he was transferred, as a temporary measure, to fill in the vacancy of Assistant Professor of Dairying at Poona. Mr. Jethanand filled the post vacated by him.

In the Mechanical Branch, Mr. R. M. Tambe continued as Assistant Agricultural Engineer; and the services of Mr. T. P. Guhrajani, who had been temporarily appointed as the Mechanical Assistant terminated, with effect from 13th October 1928.

This post has not yet been again filled up.

3. The following table shows the expenditure incurred and receipts realized during the year 1928-29 :—

Year	Staff	Expenditure Contingencies	Receipts
		Rs.	Rs.
1928-29 ..	91,089 ..	74,689 ..	59,467

Season

4. *Inundation.*—The inundation of the River Indus on which Sind agriculture mainly depends was very satisfactory. Water became available quite early and continued till late in the season. Hence there was an appreciable rise in the area under Rabi also.

5. *Rainfall.*—The rainfall during the year was very scanty. But this did not adversely affect the crops since the inundation was remarkably satisfactory.

6. *Crop pests and diseases*.—The cotton crop on the Jamrao and Nasarat received a great set back on account of a very intense attack of boll-worm, the like of which has not been witnessed during the last decade. Rats did some damage to the paddy crops in Tando and Shat Bunder sub-divisions. But the most glaring calamity in the season came down in the shape of a very severe cold wave towards the end of January 1929 which spread throughout the Province with a record severity, the like of which has not occurred before at least within the living memory.

7. *Fodder supply*.—This was sufficient in North Sind but not so in Lower Sind.

8. *Agricultural labour*.—This was sufficient generally.

9. *General*.—Taking all things together the year cannot be said to be one of the average prosperity for the agriculturist, inspite of the very favourable inundation season. The boll-worm had already played mischief with the cotton crop; but the most disastrous event was the occurrence of the frost which caused damage to Rabi and fruit crops to the extent of some lakhs of rupees.

Research and Investigation

10. This work may be divided into two parts:—

(a) Prospective work with special reference to conditions which will prevail when the Barrage is in working order.

(b) Work on crops for the present and prospective needs of the country outside the Barrage areas.

Work under (a) is being exclusively carried out at the Agricultural Research Station, Sakrand, District Nawabshah. Work under (b) is in charge of the Deputy Director of Agriculture, Sind, but the technique of all breeding work on crops is now being controlled by the Botanist, Agricultural Research Station, Sakrand. The detailed information concerning its technique is therefore with that officer and will form a part of his report. The outline of the work and its bearing on the present agriculture of the Province is briefly given below:—

11. The crops dealt with are the following:—

- (1) Rice.
- (2) Jowar.
- (3) Wheat.
- (4) Cotton.

12. *Rice Improvement*.—Work on Rice is conducted on the Larkana Farm. An area of 31 acres 2 gunthas was sown with pure selected strains of rice for multiplication as under:—

				A.	g.
Jajai	..	..	..	4	0
Prong	..	..	..	3	31
Kangani	..	..	..	18	14

In addition to this Acres 2-5 were allotted to producing seed of 3 strains for next year's sowings, Acres 1-5 were taken by the Rice breeding

section for conducting various trials on rices, Acres 1-12 came under rice seedlings and the remaining 15 gunthas were occupied by the Plant Pathologist for investigations on the "Rati" disease.

Very bumper crops were expected because of the satisfactory inundation but unfortunately there was a very heavy lodging in the entire area inspite of the prunings applied. This somewhat reduced the outturns. The average yields of the multiplication area per acre are tabulated below :—

				Lbs.
Jajai	..	..	..	1,415
Prong	..	..	..	2,027
Kangani	..	..	..	1,620

Out of the produce, the following have been set apart for distribution among the cultivators of the District for further multiplication :—

				Lbs.
Jajai	..	..	..	5,525
Prong	..	..	..	8,075
Kangani	..	..	..	29,750

13. In the trial of new and foreign rices *Bara* rice from Peshawar ripened along with Prong, taking 129 days to mature. The yield per plant was as good as either of Kangani or Prong, its quality being superior to that of the latter two varieties but not equal to that of Jajai. *Basmati* rice from Dheradun ripened fairly early and is of good quality ; but the yield per plant was rather low. *Kamod* rices obtained from Gujarat ripened very late and took 135 days from transplanting to harvest. Similarly Coimbatore rices were extremely late, taking 172 days. Besides the yield also was low.

14. Apart from these exotic rices, fresh selections which had been made from village samples in 1927, were grown, during the year under report, in single plant cultures, with the established strains as standard. Out of 82 cultures only 10 have been retained for further trial.

Bengalo, a locally acclimatized variety of Bengal, which seemed promising in the previous year was tried on field scale and yielded 732 lbs. of grain per acre. This seems satisfactory and further trials will be taken in the coming year.

• Similar investigations are being made in Lower Sind as well. For example the variety *Kangani* introduced there by the Department has self-multiplied in Badin Taluka and is now being grown by some zamindars of the locality, for this variety ripens a month earlier than Ganja which is known to be the earliest variety in Lower Sind.

15. In the year 1927-28, crosses between Kangani 27 and Kolumbia 184 were made, the former to improve the tillering capacity, and the latter to increase the number of grains per ear-head, in Kangani 27. During the year under report F1 and F2 generations were grown and the results have been quite satisfactory.

16. *Jowar Improvements*.—The area under jowars on the Larkana Farm was 7 acres and was sown for multiplication of seed with the following varieties selected out of a large collection for their high yielding capacity :—

	Acres.
(a) Baghdar	2
(b) Saoro Kartuko	1
(c) Alakh	2
(d) Red Janpur	2

To get self fertilized pure seed for the ensuing season 50 ear-heads of each variety were as usual bagged.

17. *Wheat Improvements*.—Four acres and ten gunthas were sown under irrigation for the multiplication on the Larkana Farm with the improved strain of Phandani (C.P.H. 47). Germination was good and growth very vigorous, necessitating pruning at places. The cold wave did not fortunately prove detrimental beyond checking the growth for a few days and an average yield of 1,350 lbs. per acre was obtained. The crop received two to three waterings.

18. A large area on the Jacobabad Farm is always covered by the wheat grown for seed multiplication of selected strains of Thoree (A.T.38) and of Pusa 12. The area sown during the year was 84 acres and 4 gunthas as follows :—

Variety	Area	Average outturn per acre
	A. g.	Lbs.
Pusa 12	56 34	459
A.T. 38	27 10	625

This low average is due to the havoc caused by the cold wave of January 1929 otherwise both the germination and the subsequent stand were excellent. The whole of the area was as usual "Bosi" that is the crop did not receive a single irrigation during its growing period.

It will be remembered that the Punjab 8A wheat was distributed in the Lower Sind, in the previous year, to tide over the difficulties caused by the floods. This variety has found favour with the zamindars as it seems to be rust resistant. This year, on account of financial stringency, the seed could not be supplied departmentally but nearly 22,400 lbs. were obtained for the zamindars at their cost.

Some progressive zamindars tried G.S. 25 and Punjab 11 wheats but the results have been vitiated by the record frost. It is encouraging to note that Mr. L. T. Shivdasani, a Zamindar of the Hyderabad District, obtained a yield of 1,040 lbs. per acre from Punjab 11 wheat inspite of the frost.

At the Jacobabad Farm, also agronomic investigations in respect of wheat are in hand in order to determine the best variety, the optimum seed rate of different varieties, the distance of planting, etc. The results are not conclusive but the following inferences were derived from the experiments conducted during the year under report.

(1) A.T. 38, other conditions being the same, gave higher outturn than Pusa 12.

(2) During the year under report A.T. 38 gave the best yield with 80 lbs. seed rate as compared to either 60 or 100 lbs. seed rate; whereas Pusa 12 gave best results with 100 lbs. seed rate.

(3) Similarly closer spacing between the rows (*viz.*, 9 inches instead of 12 inches) gave decidedly better yield.

19. About 9 acres were occupied under wheat (Pusa 12) also at Mirpurkhas Seed Farm. Both the germination and the stand were satisfactory but the crop was completely destroyed by the record cold of January 1929.

20. *Cotton Improvement.*—On the Seed Farm, Mirpurkhas, the total area sown with the cotton for seed multiplication was as follows:—

Variety	Area in acres	
	A.	g.
4F	19	9
27 W.N.	51	23

The germination was satisfactory and good outturns were expected but for the severe shedding of bolls due to rot and worm the loss was heavy; but thanks to the favourable inundation season the average yield still came to 604 lbs. per acre in case of 4F and 602 lbs. per acre in case of 27 W. N.

The ginning percentage of 4F American cotton was 33 per cent. and of 27 W.N. was 39.1 per cent.

21. *Chellaro Plot.*—The Chellaro Plot (Taluka Mirpurkhas) started six years ago for multiplication of cotton seed, had the following area under cotton in the year under review:—

	A.	g.
4F	180	26
27 W.N.	336	24

Here also the crop was attacked by the Boll-worm and Boll rot but due to good inundation season, the average yield per acre was not bad. It came to 572 lbs. in case of 4F and 590 lbs. in case of 27 W.N. The Plot showed a net profit of Rs. 17,572 after paying Rs. 2,643 as revenue assessment and Rs. 899 as pay and travelling allowance of the staff attached to the Plot.

It is gratifying to note that the Haris were induced to do the preliminary ploughing of the land in its dry condition before sowing the crop. Nearly 300 to 350 acres, out of the total cotton cultivation of about 517 acres, were treated in this way. Further an interculturing was given by the Haris by means of bullock power where the growth

was thin and by means of hand labour where the growth was thick. This obviated to a large extent the necessity of hand-weeding the whole crop, an operation everywhere known to be costly.

Miscellaneous Crops

22. *Gram and Matar*.—Two popular leguminous crops of the Rabi season are Gram and Matar. These are grown chiefly at Jacobabad and Larkana Farm and to some extent also at Mirpurkhas Seed Farm. During the year under report the crops failed all through on account of the record cold wave referred to before. Matar at Larkana Farm had however escaped the frost but was unfortunately attacked by aphids. At the Jacobabad Farm some of the area under Gram had been grazed by the cattle just prior to the frost so that this escaped the detrimental effect with the result that the average yield came to 343 and 402 lbs. per acre from Pusa White and Local Red variety respectively.

23. *Berseem*.—This is a fodder crop originally imported from Egypt. It is of paramount importance where irrigation facilities exist, for it provides nutritious fodder at a time when there is dearth of other good fodder (*viz.*, December to June). Besides it is a very powerful soil recuperator and on account of its resistance to salt it is in the perennially irrigated tracts of Egypt, considered to be the “key” to cultivation of alkaline lands. Of the Government Farms in Sind, it is possible to grow this at the Willingdon Cattle Farm, Sukkur Farm and Larkana Farm. The area under this crop at the above Farms was 3 acres 20 gunthas, 19 and 6½ acres, respectively. The cold wave had its effect felt on this crop as well but in spite of it, the crop at Sukkur Farm gave an average yield of 28,828 lbs. of green fodder per acre whereas at Larkana Farm it came to only 12,330 lbs. At the Willingdon Cattle Farm however the yield was 75,103 lbs. per acre.

Berseem is now very largely grown at Hyderabad where there are irrigation facilities. The area is yearly on the increase. The quantity of seed imported from Egypt during the year under report was 5,680 lbs. of which about 3,000 lbs. were distributed among zamindars.

Much progress in the cultivation of this crop cannot however be achieved unless the seed is produced locally. Experiments in this connection continue to be conducted both at Larkana and Sukkur Farms, for it has been seen that there are greater possibilities of seed formation of Berseem in Upper Sind than in Lower Sind. During the year under report Plot B3 at Sukkur Farm, covering an area of one acre, has yielded 207 lbs. of seed after two cuttings had been taken, whereas at Larkana 2 acres have yielded 290 lbs. of seed or 145 lbs. per acre.

24. *Elephant Grass*.—This is another fodder that is being grown both at Willingdon Cattle Farm and Sukkur Farm on a small scale.

25. *Manurial Trials*.—The use of Sulphate of Ammonia as a substitute for cowdung to raise rice seedlings as demonstrated by the Larkana Farm and on which two separate leaflets have been issued by the Department is now getting more and more popular. An agency dealing in

this artificial manure has now been started at Larkana to meet its growing demand.

Messrs. Shaw Wallace and Company, Calcutta, gave a concentrate, viz., Ammophos for trial on paddies. This was used on the Larkana Farm. Dose at the rate of 200 lbs. per acre was applied but the crop lodged so heavily in spite of the pruning that the experiment was vitiated. The experiment will be repeated in the coming season.

Bonemeal as a field manure on paddy lands was tried in Tando Division but the results do not seem to be encouraging but Sulphate of Ammonia as field manure increased the yield over 33 per cent.

At Mirpurkhas Seed Farm, Calcium Cyanamide was tried either alone or mixed with farm yard manure or castor cake. The experiment however remains inconclusive as the treated plot did not show any superiority over the check plot.

At the request of Mr. S. H. Kerai, Commission Agent, Bombay, the two bacterial preparations, one in the liquid and the other in powder form, sent by him were tried on cotton (27 W. N.) and Bajri on this Farm. The result on cotton show an increase of 19 per cent. in the case of liquid and 15 per cent. in the case of powder preparations. In Bajri however no difference could be seen in the area treated with Bacterial preparation and the area untreated.

26. *Crop Pests and Diseases.*—As mentioned before the most striking pest in the Kharif was the Boll worm on cotton. It destroyed the crop to a considerable extent. The disease was investigated by the Cotton Entomologist kindly sent by the Director of Agriculture from Surat. As a result of his close examination, at the end of September, he found that the cotton varieties were affected differently as under :—

Variety of Cotton				Intensity of disease
Punjab-American 285F	..	..	..	80 per cent.
Punjab-American 4F	..	..	..	70 per cent.
Local	...	...	..	40 per cent.
27 W. N.	..	..	..	35 per cent.

As for the time of sowings, the observations in the case of Punjab-American cottons were as follows :—

	Per cent. damage.
April sown	68
May sown	42

In case of 27 W.N. the observations were as follows :—

	Per cent. damage.
May sown	57
June sown	Nil.

Rats did some damage on paddy fields both in the Hyderabad and Karachi districts but the loss was not very heavy. Rat pest demonstration with Cynogas pumps was continued as usual. 6,543 acres of land were treated and the success of the demonstration can be judged from the fact that 25 pumps were sold during the year.

There were a few local attacks of grass hoppers on rice in Larkana and instructions to control the same were being freely issued. Late grown rice in Larkana was attacked by "Rati" to some extent. Aphids destroyed such Rabi pulses as had fortunately escaped the frosts. As for the frost itself, a cold wave of similar intensity is not known to have swept over Sind before.

Crabs too did some slight damage in the early stage of the rice crop. An experiment was conducted on the lands of Diwan Himatsing Khem-sing in the month of August where about 25 acres were treated with half a gallon of carbon-bi-sulphide. This chemical takes about 20 to 30 minutes to kill a crab inside a burrow. The operation was very successful. The working cost came to about nine annas per acre.

27. *Fruit*.—As Sind possesses conditions which are favourable for the production of certain classes of fruits, like dates, grapes, and citrus and as the Sukkur Barrage Scheme is expected to bring in near future an enormous tract of land under perennial irrigation it was thought wise by the Bombay Department of Agriculture to prepare in advance the information, men and plants, the demand for which will be great when the water becomes available. The Agricultural Farm at Mirpurkhas was therefore in the year 1926 converted into a fruit Research Station to make the necessary investigations. This Farm however already possessed 8 acres of about 15 years old fruit trees which have served as a nucleus for further development in the fruit culture. But unfortunately the natural calamities to which Sind has been subjected during the past two years has retarded progress. The record floods of 1927 devastated all the young stock of the new fruit area and immediately in the following year (under review) came the severe cold wave which damaged and in some cases killed the mango trees and the nursery plants consisting of mango stocks, Kagzi lime seedlings, etc. The aged plants of grapes and peaches which were in rest at that time and also Citrus varieties however escaped the damage so also the date palms and the roses. But a large number of raisin and table varieties of grape rootings (1,500) have now been imported from the United States of America, and some from other parts of India. The plants ordered from America arrived as late as in the second fortnight of April 1929, which is the most unfavourable season for transplanting plants in the open. In almost all the cases, the new wood of the cuttings had dried up and had to be pruned away to healthiest basal but close to the old wood. All the rootings were transplanted in pots and kept in a propagating house where about 55 per cent. of them are growing vigorously.

During the year under report the Commercial value of Marsh Pamelos better known as "Grape Fruit" was explored with promising results

for export purposes, two consignments of this fruit were sent to Bombay for this purpose and fetched the following prices :—

Quantity of fruit	To whom sent	Railway freight to Bombay	Amount realized at Bombay	Net realization
			Rs. a. p.	Rs. a. p.
267	Army and Navy Stores ..	13/5	86 10 0	73 5 0
48	Vithal Bhaggoji and Co. ..	3/8	33 0 0	29 8 0
315	Total ..	16/13	119 10 0	102 13 0

The net price per fruit works out at 0-5-2 a piece. But this includes cost of packing and incidentals at Mirpurkhas. Deducting these the net cost realized per fruit should not be less than 4 annas. It is intended to send all the produce next year to Bombay to confirm these figures and also to see how far the prices obtained in Bombay are favourable as compared to those obtained locally from a commercial point of view.

It has become urgently necessary to devise means to combat the "die back" disease and the white ant pest.

The total sale proceeds of fruits, etc., during the year under report amounted to Rs. 1,821-5-2.

28. *Dates*.—A departure from the routine programme at Sukkur was made this year when seven varieties of Date palms, imported from Iraq, were planted for trials. In all 265 plants were indented of which 6 died on the way and 44 lost their labels indicating the variety, and were therefore treated as mixtures. Of the balance, 54 were distributed among fruit growers and the rest were planted at the Farm. The condition of the offshoots, when arrived was far from satisfactory. The health of the plants in the cold weather was good until the end of January when the severe spell of frost affected the young plants considerably, some of them dying a few weeks later. The number of plants now standing in the orchard is as under :—

Variety	No. of plants
Dairi	27
Khadhrawi	5
Khastawi	18
Hallawi	16
Sayir	7
Zehdi	15
Brain	15
Mixtures	27

29. *Livestock Improvement.*—The work in the direction of cattle improvement consists in the—

(a) Maintenance and improvement of a herd of cattle of Red Karachi breed at the Willingdon Cattle Farm near Malir (Karachi) and (b) maintenance and improvement of a herd of buffaloes at Government Farm, Sukkur.

30. *Willingdon Cattle Farm.*—The administrative control of this Farm is vested in the hands of the Deputy Director of Agriculture, whereas the technical policy is controlled by the Live Stock Expert to Government.

The Red Karachi breed is recognized to be the best milk producing cow in Asia, and it is in order to maintain the good qualities of this breed and to eliminate some of its defects, such as long ill shaped pendulous udder, that the Farm has been established. During the seven years of the existence of the Farm, substantial progress has been made towards improving the milking capacity, the size and the udder development. It has already been noticed that the heifers which have been calving of late are a distinct improvement over their dames. During the year under review, the Farm had :—

- 1 cow giving over 7,500 lbs. milk per lactation.
- 2 cows giving over 7,000 lbs. milk per lactation.
- 1 cow giving over 6,500 lbs. milk per lactation.
- 3 cows giving over 6,000 lbs. milk per lactation.
- 10 cows giving over 5,000 lbs. milk per lactation.
- 6 cows giving over 4,000 lbs. milk per lactation.

During the year under report seven bulls were used on the Farm for service and performed 60 services. The number of bulls issued under Premium Bull Rules was three. The total quantity of milk produced was 139,377 lbs.; and the total sale proceeds amounted to Rs. 6,460-5-4.

The number of animals sold during the year was 13 and the number purchased was nil. The number of births was 30 and death nil (one still birth has not been accounted for in the above remarks).

The total strength of the herd on 1st April 1929 was as under :—

Breeding bulls	..	..	..	..	6
Young Bulls	..	..	..	..	30
Work cattle	..	..	..	..	13
Cows	..	..	..	..	42
Heifers	..	..	..	..	41
Castrated stock	..	..	..	..	3
Bull calves	..	..	..	..	6
Cow calves	..	..	..	..	6

31. *Buffalo Herd at Sukkur.*—The buffalo herd was started in 1918-19 with a view to investigating the possibilities of mixed farming and also improving the local breed by selection of the best milkers. By this

time the animals of the second generations are in performing condition. The strength of the herd on 1st April 1929 was as follows :—

Adult buffaloes	..	..	..	..	10
Heifers in calf	..	..	..	..	3
Bull calves	..	..	..	..	7
Heifers calves	..	..	..	..	15
Bulls	..	..	..	..	2
					—
					37

During the year under report, there were 9 births and no death. One calf was sold. As for diseases, there was three days-sickness prevailing in the month of December and the following animals suffered as the result thereof :—

Adult buffaloes	..	..	..	..	2
Heifers in calf	..	..	..	..	2
Heifer calves	..	..	..	..	2

As a result, the milk yield of one buffalo then in milk, considerably decreased.

During the year under review, the best animal gave 6,459 lbs. of milk per lactation as against 5,144 lbs. last year. The average per head per annum was 3,325 lbs.; the low average being due to the fact that percentage of fresh buffaloes in milk during the year was lower than in the previous years. The total production of the milk was 27,411 lbs.

It has already been mentioned in the last year's report that heifers are doing better performance in comparison to their dames.

The want of housing accommodation for the stock and more area for grazing is keenly felt.

Demonstration and Propaganda

32. The progress of demonstration and propaganda with retrospective effect has already been reviewed in last year's report. It will suffice only to mention that the progress is very steady and that everything that the limited resources of the Department permit, is being done for the benefit of the cultivator. The Taluka Development Associations as well as the regular staff of the Department are getting busier day by day. The demand for improved seed and modern implements is ever on the increase. In some cases, as for example, in case of demand of 27 W.N. cotton seed it has become well nigh impossible to cope up with the ever increasing demand. The progress in case of rice is evident from the fact that 43,350 lbs. of improved strains of paddy seed were distributed from Larkana Farm. The 27 W.N. and 4F cotton seed distributed, during the year under report, amount to nearly five and a half lakhs of lbs. which figure too should have considerably increased but for the low outturns of the previous year, due to record floods in the Jamrao tract and the severe attack of boll-worm during the year under report.

It is gratifying to note that due to favourable inundation season there was a regular rush for Punjab-American Cotton seed at the ginneries,

so much so that in Southern Jamrao tract, area under American cotton even exceeded ordinary Desi cotton, which is indeed a welcome surprise. The Executive Engineer, Southern Jamrao, gives the following figures of cultivation in his beat :—

	Acres.
American Cotton	34,436
Ordinary Desi cotton	33,090

In case of wheat again, 66,048 lbs. of seed (41,388 lbs. of Pusa 12 and 24,660 lbs. A.T. 38) were distributed from Jacobabad Farm. 12,686 lbs. of various strains of wheat were further issued from Sakrand Research Station.

Likewise prejudices against the introduction of modern implements also are slowly dying out. For example, in case of drilling the cotton seed, the Divisional Superintendent of Agriculture reports that 215 acres of cotton were drilled this year in the Jamrao tract quite independently, without the aid of the Association Kamgars.

In matter of dry ploughing, the same officer writes "it is no exaggeration to state that, at present, dry ploughing will be found in practice to the extent of about 50 per cent. of land cropped with cotton whereas two or three years ago it existed hardly to the extent of 5 to 10 per cent. "

33. *Implements.*—The rapid introduction of improved implements is amply proved from the ploughing figures of Departmental sales by the Divisional Superintendent of Agriculture, which pertain only to Nawabshah and Jamrao tracts :—

Name of implement	No. sold
Sarkar Ploughs	525
Meston Ploughs	162
Hyderabad Ploughs	2
Hindustan Ploughs	2
Iron levellers	3
Iron Clod crushers	2
Sindhi plough steel shares	70
Sarkar plough steel shares	96
Marwari drills	8
Hand Archimedian screws	5
Iron Nars and Hurlas	131
Rat killing pumps	6
Total	1,012

It must, besides, be understood that in case of Sarkar and Meston ploughs and some other implements, these Departmental sales are being largely supplemented by sales direct from local manufactures, as a number of small factories for the purpose have now sprung forth in the tract. The figures noted above are the returns only for Nawabshah and Jamrao tract; but similar sales are being pushed forth in other Districts as well and even at Larkana some local factories have come into being, pushing

forth implements recommended by the Department. The popularity of Cynogas pumps to destroy rats in the Tando and Shah Bunder Divisions has already been mentioned elsewhere in this report.

Village to Village demonstrations with improved implements and seeds have already become a routine, and are carried out both by the Departmental staff and through the agency of the Taluka Development Associations.

33. *Mechanical Farming*.—As time passes on and as the opening of the Barrage Canals System appears more and more in sight, the necessity to explore the possibilities of Mechanical cultivation in Sind makes itself more strongly felt. Accordingly, the Department organized two extensive district itineraries of motor tractors one in North Sind and the other in Middle Sind. In the former area the Cletrac tractor and the International plough were demonstrated whereas in the latter area the International tractor and a three bottomed mould board plough were worked.

The Middle Sind demonstration started on the 10th November from Saidabad and ended on 23rd December at Tando Allahyar, after running through Halla, Matiari, Karamzamani, Shahdadpur, Uderolal, Tando Adam and Hyderabad. The tractor did in all 161 miles of road journey, ploughing 90 acres of land on the way. The demonstration was a great success and some Taluka Co-operative Associations were so very satisfied with the work that they have resolved to purchase their own tractor as early as possible. Thanks of the Department are due to Messrs. Burmah Shell Oil Storage and Distributing Co. for having supplied most of the fuel and lubricants, free of charge.

In addition to these District Demonstrations, there were four-week end demonstrations organized at Sakrand, when zamindars from Naushahro, Shahdadpur, Halla and Hyderabad Talukas were brought over to see the Farm, one of the important items on the agenda being the demonstration of Motor tractor. Several enquiries were directed and satisfactorily explained, Deputy Director of Agriculture being present.

Once again the motor tractor was demonstrated at Sakrand in January 1929, when the Honourable Members of the Legislative Council, Bombay Presidency, and some prominent local officers visited the Farm; the Honourable Minister of Agriculture and the Director of Agriculture, Bombay Presidency, themselves being present.

In addition to these, there was another successful demonstration at Mirpurkhas in the same month where too the Honourable Minister of Agriculture attended the function.

Trials of Mechanical cultivation were taken at Jacobabad Farm too, where the entire area under wheat was sown with the Hoosier Seed Drill drawn by a motor tractor. The output was nearly two acres per acre at 6" space between rows, with 80 lbs. seed rate per acre. This close spacing, which is very advantageous in "Bosi" cultivation, is not possible to achieve with bullock power.

Likewise at Larkana Farm, the threshing operations were conducted with power machine and the cost came to $3\frac{1}{2}$ annas per maund as against $4\frac{1}{2}$ annas in case of bullock power.

Inquiries of various types regarding pumping plants, borings, tractors, etc., are being received and duly attended to either by the Deputy Director or by his Mechanical staff.

34. *Agricultural Shows*.—During the year under review, three big demonstrations were organized at Tahilpur (7 miles from Mirpurkhas) Seed Farm and Nawabshah in addition to the usual Show at Jacobabad where this time the number of entries both in Agricultural and Cattle sections was the highest on record.

The Agricultural and Co-operative Officers of Dutch East Indies Government who had come here on an all India tour to watch the activities of these Departments in India, arrived at Tahilpur on the 11th November 1928, when about 500 people were present.

The Seed Farm Mirpurkhas demonstration organized on the 18th of January 1929 when Honourable Mr. B. V. Jadhav, Minister of Agriculture, Bombay Presidency, had attended, was a great success, the total number of visitors being about 700.

The Nawabshah demonstration organised on the 8th and 9th of April 1929 was even grander, where the Officer-in-Charge, Sakrand Research Station, also fully collaborated. People collected to the extent of over 2,000.

35. The two small sub-stations at Nawabshah and Jamesabad were again run successfully. They gave a net profit of Rs. 208 and 144 respectively during the year.

36. In order to give sufficient publicity to the work of the Department an appointment of the Inspector of Agriculture for Publicity has been created in the Upper Subordinate Service under the Agricultural Development under the Lloyd Barrage from May 1928. This officer has been attached to the office of the Deputy Director of Agriculture with his Headquarters at Karachi for the present.

37. A Committee has been appointed by Government to investigate into the question of Cattle Supply and Improvement, in their Order No. 6567/24 dated 14th July 1928 consisting of 3 Official and 3 Non-Official Members with the Revenue Officer, Lloyd Barrage as Chairman, Deputy Director of Agriculture being one of the Official member of the Committee. This Committee up to 30th June had about 5 sittings and transacted some part of business including the issue of a Questionnaire to representative Cattle Breeders and Land owners.

The Committee expects to hold 5 more meetings before being able to issue a report containing its recommendations.

GULMAHOMED A. R.,

Deputy Director of Agriculture, Sind.

APPENDIX I

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURE, POONA, FOR THE YEAR 1928-29

Charge.—Mr. V. G. Gokhale was in charge of the section throughout the year.

2. *Lines of work*—A. *Teaching* is the primary work of this section and includes the teaching of Agricultural subjects (including Animal Husbandry and Dairying) of the University courses for the degree of B.Ag. of the Poona Agricultural college, which represents about 50 per cent. of the total teaching work of the college. For the teaching of practical work two large institutions, *viz.* the college farm and the college Dairy, have to be run.

In addition to the teaching of the University courses this section has also to do the teaching of Agriculture (including Animal Husbandry and Dairying) to the "Short Course" class which forms nearly 73 per cent. of the total instructional work given to this class.

Special courses in farm management, Poultry and Animal Husbandry are also given to a limited extent as resources can permit.

B. *Research and Investigation.*—After satisfying the primary needs of teaching and administration of the two institutions connected with teaching, whatever is possible to be done during odd and disturbed periods, is being attempted.

C. *Commercial working of the Dairy.*—The college Dairy besides affording facilities for teaching is run on commercial lines.

D. *Aid and Assistance to the Public.*—A number of demands for seeds, implements, etc., and information on Agricultural and Animal Husbandry matters are received from the Agricultural public and educational institutions either by correspondence or in personal visits which have to be satisfied.

3. *Staff.*—With one additional Graduate Assistant for fertiliser experiments, the strength of the staff was as follows:—

- 1 Professor of Agriculture in the Indian Agricultural Service.
- 2 Assistant Professors in the Bombay Agricultural Service.
- 3 Lecturers.
- 5 Demonstrators.
- 1 Graduate Assistant for fertiliser experiments.

A. *Teaching*

4. The result of the Sr. B.Ag. class in the University Examination in the subject of Agriculture was this year better (87 per cent.) than that (57 per cent.) in the last year, although there has not been any change in the general low calibre due to the reasons detailed in the last year's report. Much progress could not be done in solving the difficulty of the absence of text books in the subject of Agriculture on account of the full time of the staff available in the Agricultural section being used up by their normal teaching and administrative duties.

The number of students taking intensive study of crops as their optional subject continued to be small owing to the same reasons as cited last year.

The quality of the students attracted to this college last year did not show much improvement over that in the past, and unless some inducement such as one guaranteed post in the higher grades of Government Service, suggested in the last year's report, be held out, there seems little hope of mending the position.

5. The special courses given during the year were as follows :—

	Period	No. of students
1. Proper handling and management of iron-plows.	One week.	4
2. Farm management	1 College term.	1
3. Practical Dairying	15 days.	1
4. Practical Animal Husbandry and Dairying.	15 days (at another time).	2
5. Farm management and Implement working.	4 days.	1
6. Irrigation Officers, Training Class in implements and crops work.	2 days.	10

6. *The college farm.*—The main function of the farm is to afford all possible facilities for the teaching of practical Agriculture. It also contains a fairly complete collection of indigenous and improved Agricultural Implements both for students as well as the general public and a workshop for the teaching of carpentry and smithy by the Engineering section of the college and for a certain amount of repair of improved implements of the public when possible.

The area has remained at 275 acres of which about 125 acres are cultivable, the rest being under college and other buildings, roads, wells, grazing area and waste land.

As regards the season the total rainfall of the year from 1st of May 1928 to 1st of May 1929 was 25·38 inches. The rainfall in the growing period of *kharif* crops though sufficient as regards the total quantity was not quite satisfactory in distribution. *Kharif* sowing could not be started till about the middle of July and the rainfall was again found to be insufficient for all the growth of the crops till the last week of August. Rains during the latter half of the *khairif* monsoon were favourable to the *rabi* crops, which had on the whole a good stock of soil-moisture from the last of the monsoon rains and received a further re-enforcement of about two inches in the month of October after sowing.

There was frost in the beginning of February which did some damage to the crops then growing. Pumpkins, Punjab American cotton and

manjav variety of sugarcane suffered cent per cent., potato and bottle gourd 50 per cent., while H. M. 544 variety of sugarcane and sweet potato suffered the least. The exact effect of this character of season on the crops can be seen from the following statement :—

Crop	Average yield per acre 1928-29	Average yield per acre 1927-1928	Best yield in the history of the farm	
			Per acre	Year
<i>Kharif season</i>	Lbs.	Lbs.	Lbs.	
Early groundnut (Spanish peanut).	1,444	1,305	2,082	1912-1913.
Late groundnut (big Japan).	2,560	1,924	2,768	1913-1914.
Bajri	1,004	1,181	1,632	1912-1913.
Cotton N. R. ..	868	752	1,900	1919-1920.
Fodder jowar (Nilwa) ..	12,738	10,000	12,738	1928-1929.
<i>Rabi season</i>				
Shalu jowar	2,518	1,370	2,518	1928-1929.

Thrips on onion and chillies, aphid on lucerne, *mogari* and cabbage, *tika* disease on small Japan, rust on wheat (Pusa 4), leaf curl on chillies, wilt on *rabi* potatoes were the important diseases and pests that did considerable damage to these crops, which could not be controlled by the methods known.

The most outstanding features of the year's cultivation of the farm were : Almost all the important *kharif* dry crops, tobacco (1,590 lbs., Rs. 90), groundnut big Japan (2,560 lbs., Rs. 70), *nilwa* fodder *juar* (12,738 lbs. of dry fodder, Rs. 20), grain *juars* of *gidgap* from Satara and *Elichpuri* from Khandesh (1,700 to 1,800 lbs. of grain and 4 tons of kadabi, Rs. 20) and N.R. cotton (879 lbs., Rs. 10) resulted into profits per acre as stated against each, on account of their increased yields this year as compared with those of the previous year in which *nilwa* fodder was the only one profitable. *Bajri* and early groundnuts even with higher yields than in the last year could not reach the point of profit. Amongst the garden crops *suran* (16 tons, Rs. 942), yams and *gavar* (4.2 tons + 1.7 tons, Rs. 137), betelvine (169 *kudatans*, Rs. 413), lucerne (29 tons, Rs. 272) have all continued to be profitable, though the actual profits stated against each have in the first three cases been less than those of the last year on account of decreased yields and less prices of this year. Ginger (3.5 tons, Rs. 456), tomato (9 tons, Rs. 549), double beans (2.1 tons, Rs. 226), Gujarat brinjal (17 tons, Rs. 344), and red pumpkins (8 tons, Rs. 62) which did not result into a profit last year have done so this year. Garlic and cabbage which had yielded a profit last year have failed to do so this year, while chillies, potatoes and bottle gourds have continued to be profitless, on account of pests and diseases.

7. *The Dairy*.—The needs of this institution for modernising and for furnishing specimens of all the principal kinds of breeds of farm animals from a teaching point of view yet remain unsatisfied.

B. *Research and Investigation*

The following is a resume of the work done and progress achieved during the year.

8. *Field Scale Control of Thrips on onions and chillies*.—This investigation was undertaken on the recommendation of the Crop Research Committee meeting of May 1928. The work has been carried on by the Professor of Agriculture in collaboration with the Assistant Professor of Entomology.

All the stages of this pest are found on the plant at the same time from the beginning to the end of the crops. (1) Kerosine oil emulsion (1 : 8), (2) Florisol, a proprietary product of Messrs. Pulveria and Co., Bombay, were found effective to the extent of 50 to 60 per cent. by one field scale spraying. Both were found to produce blighting effects on leaves. The plant recovers from the blighting effect of kerosine oil emulsion but not from that of florisol. How far this blighting affects the yield could not be determined. One acre of chillies required 80 gallons of kerosine oil emulsion costing Rs. 30 and 4 operators for 4 days.

In the case of onion, kerosine oil emulsion and calcium cyanide killed about 60 to 70 per cent. of thrips and the cost for one spraying came to Rs. 16 per acre for 25 gallons for kerosine oil emulsion and 4 operators for 1 day as against Rs. 35 for 20 lbs. calcium cyanide. Kerosine oil emulsion has a blighting effect on the leaves as on chillies, but calcium cyanide has none.

Cent per cent. destruction is possible by repeating the treatment three or four times at an interval of three or four days; but the cost becomes prohibitive and re-infestation takes place very rapidly, so in practical effect the remedy is not useful under field conditions. Study of the life history of the pest so as to find out if by any means re-infestations can be prevented is indicated. It has therefore been decided to suspend these experiments until the life history of the insect is worked out.

9. *Accurate preliminary testing of the value of Artificial Fertilisers*.—In acceptance of the recommendation of the Research Committee meeting of May 1928 that, before undertaking any experiments on artificial fertilisers, the Professor of Agriculture should first carry out on a small but intensive scale such experiments in order to obtain the indications, the following fertilisers were tried :—

- (1) Ammophos.
- (2) Nitrate of Soda.
- (3) Sulphate of Ammonia.
- (4) Calcium Cyanamide.
- (5) Leunaphos.
- (6) Nitrophoska.

Only two *rabi* crops *shalu jowar* as a dry crop and onion as irrigated were handled. The quantities of fertilisers tested were equivalent to supplying

10 lbs. of nitrogen per acre for *shalu* and 20 lbs. for onion. A foundation of organic matter in the form of farm yard manure about one cart for *shalu jowar* and four carts for onion was supplied in every case; an additional dose of farm yard manure to supply the same amount of nitrogen as supplied by the artificials was also included in the experiment.

The experiment was carried out in small plots of 15 feet $\times$ 15 feet which gave a net plot of 10 feet $\times$ 10 feet after leaving a ring of 2½ feet on all sides. Each treatment was compared with its corresponding check. There were three replications.

Shalu.—The figures in the three replications were very variable but on an aggregate of all, leunaphos gave, on plot basis, an increase of 20 per cent. and others from 4 to 7 per cent. Leunaphos, with the crop of 2,500 lbs. of grain per acre as obtained in the plot with only foundation doze, thus gives a net profit of Rs. 14. On per plant basis leunaphos gave 6 per cent. increase while others gave very little.

The poor response by the dry crop of *shalu* to artificials has raised the issue whether the artificials have been at all dissolved and moved to the root zone in the comparatively smaller water content of the soil in a *rabi* season. The Agricultural Chemist has been entrusted with the investigation of this issue.

Onions.—Results obtained with onions are much more marked than with the dry *rabi* crop of *jowar*. There is a fair agreement in the performance of the different treatments in all the three replications. On an aggregate of all the three series, sulphate of ammonia, ammophos and leunaphos gave significant increases of 27, 20 and 18 per cent. over their checks respectively.

10. *Relation between the vigour of chillie seedlings and yield (with Mr. H. M. Desai)*.—The results obtained in the year under report agree with those of the previous year in that raised beds and complete manure consisting of 1·25 lbs. sulphate of ammonia, 5 lbs. of sulphate of potash and 6 lbs. superphosphate per one hundred square feet in addition to the usual doze of farm yard manure make a very distinct contribution to the vigour of seedlings.

The exact effect of this added vigour of seedlings on the final yield was tested during the year with the results that raised beds alone added to the yield by 15 per cent. while the top dressing of complete manure contributed a further addition of 35 per cent. over the yields obtained from seedlings with ordinary treatment of flat beds and farm yard manure.

These results would be verified for one or two years more to arrive at and publish the final conclusions.

11. *Developing of early maturity and regular calving in Sindi cows and Surti buffaloes of the college Dairy: Incollaboration with the Assistant Professor of Animal Husbandry and Dairying*.—From an examination of the material available, it appears that early maturity has been achieved almost to the desirable point, the average and minimum age of first

calving having been lowered to three years and 2·5 years respectively in the case of Sindi cows and 3·5 years and 2·8 years in case of Surti buffaloes.

12. *Economic possibilities of the Poultry Industry in the Deccan.*—This work having been transferred to the Live-stock Expert to Government from October 1928, he is to report the progress in this activity.

13. *Some striking results of the students' Experiments.*—In order to give to the students of the degree course a practice in carrying out field experiments, a number of simple experiments are assigned to them. The following is a resume of some giving striking results most of which have been obtained from the mean of three to four replications:—

Name of crop	Nature of Experiments	Results
Bajri	Distance of sowing (9 vs. 12 inches) 4 replications.	12 inches distance between lines gave an average increase of 245 lbs. more grain per acre, i.e., about 15 per cent. over the 9 inches distance.
Kharif grain jowar (Elichpur).	Distance of sowing (18 vs. 24 inches) 4 replications.	24 inches gave an increase of about 13 per cent. both in grain and fodder the former amounting to 200 lbs. per acre.
Winter grain jowar (Maldandi).	Distance of sowing (18 vs. 24 inches) 2 replications.	Showed no significant differences.
Do.	Heavy vs. ordinary seeds, 2 replications.	Heavy seed by sieve and <i>sup</i> gave an increase of 590 lbs. grain per acre or 24 per cent. over ordinary seed.
Tobacco	Variety trial (Gandhi No. 6 vs. "Satara" 5 replications.	There was no appreciable difference in the yield between the two varieties.
Lucern	Bed vs. ridge and furrow cultivation, 2 replications.	Ridge and furrow method during the year under report which is the second year of the plantation, has no significant difference.
Do.	Value of mineral superphosphate 300 lbs. per acre.	Showed no significant difference.
Suran	Relation of weight of seed to final yield.	Corms weighing from 3 to 5 lbs. each all produce finally equal weight of corms, viz., 17 lbs. Corms between $\frac{1}{2}$ lbs. to $2\frac{1}{2}$ lbs. each gave proportionate weight of final corms varying from 9 to 15 lbs.
Do.	Most determining plant food element for suran on medium black soil.	Application of 115 lbs. of nitrogen ² as sulphate of ammonia, 170 lbs. of K_2O as sulphate of potash and 84 lbs. of P_2O_5 as superphosphate, i.e., quantities contained by a 16 tons crop per acre singly and in combinations

Crop	Nature of Experiment	Results
Ginger	Artificial manures, 1 replication	in addition to 20 cart loads of farm yard manure shows that nitrogen is the ruling element, potash and phosphoric acid either alone or in combination with nitrogen having tended to decrease the yield. Nitrogen alone in addition to 20 cart loads of farm yard manure has increased the yield by 3.5 tons or 24 per cent. over a dose of all the three Artificiala. A dressing of 45 lbs. nitrogen, 52 lbs. K_2O and 22 lbs. P_2O_5 i.e., about the quantities contained by an average crop of 10,000 lbs. given in the form of sulphate of ammonia, sulphate of potash and superphosphate respectively in addition to the usual manure of 20 cart-loads of farmyard manure per acre, yielded an increase of 1,534 lbs. per acre, i.e., about 21 per cent. more than the same quantity of farm yard manure, and 800 lbs. of groundnut cake and gave a net profit of Rs. 185. One-fourth less of the above artificial dose gave very nearly the same profit.

C. Commercial working of the college Dairy

14. Besides affording facilities for practical teaching, the college Dairy is intended to demonstrate the possibilities of modern dairying as a business and to serve as a centre of breeding pedigree animals of Sindhi cows and Surti buffaloes.

The total strength of the herd was 215 as against 225 of the previous year. According to the policy of bringing down the number of cows and increasing the number of buffaloes adopted since last year, the number of cows and cow heifers was reduced by 17 while the same for buffaloes was allowed to inflate by 20, the remaining reduction in the total number being due to the disposal of 8 working bullocks which have been unserviceable, and five bull calves not worth keeping.

The following table compares the performance of the animals during the year with that of the previous year :—

Year	Average number of milch animals in the herd			Average annual yield per-head of		
	Total	Cows	Buffaloes	Cows	Buffaloes	Whole herd
				Lbs.	Lbs.	Lbs.
1927-28	76.91	30.70	46.21	3,062.32	3,175.83	3,130.5
1928-29	95.10	28.70	66.40	2,810.8	3,278.0	3,186.8

The average yield per cow per annum, has been lower this year by 250 lbs. than that of the last year, on account of the new calvers of this year having given about 6,000 lbs. of less milk than the same number during the last year. This is due to one of new calvers having yielded practically nothing due to mammitis, and the number of dry days being on an average of the whole herd 12 more this year than in the previous year. The average yield of buffaloes shows an increase by 100 lbs. per head per annum, which is due to the average number of dry days per head being lessened on account of the addition of a considerable number of animals in milk by purchase during the year. Thus there has been no striking difference from the normal performance of the two herds exhibited last year.

The subjoined table compares the financial aspect of the year under report with that of the previous year :—

Year	Average number of milk animals in the herd	Average number of animals milked	Total milk production in	Annual average milk yield per head of the herd	Total milk fed to calves	Total milk sold	Cost of production of 100 lbs. of milk	Money realised per 100 lbs. of milk
			Lbs.	Lbs.	Lbs.	Lbs.	Rs.	Rs.
1927-28 ..	76.01	59.51	240,709	3,130.5	29,225	211,544	(19.26)	16.35
							16.98*	
1928-29 ..	95.1	76.9	298,318	3,136.8	28,302	270,016	(18.69)	17.45
							16.92*	

Note.—Figures in brackets show the cost of 100 lbs. of milk available for sale after feeding calves.

Figures with this *mark show the cost of 100 lbs. of milk as the total output of milk yield.

With almost the same average yield per animal per annum, the cost of producing 100 lbs. of milk including that fed to calves has remained the same as last year, but that for 100 lbs. of milk excluding that fed to calves has been lower than that for the last year by over nine annas as a result of the proportionately larger number of calves of purchased animals being allowed to suckle and not therefore requiring any milk for feeding. The value realised per 100 lbs. has increased by one rupee and one anna, as, on account of regular contract of Sassoon Hospital for a large and fairly steady supply of milk comparatively much smaller quantity of milk had to be turned into butter or ghee, which is always very much less remunerative.

The total area under fodder crops was 180 acres out of which 120 acres was cropped only once, and the remaining was made up by cropping 27 acres more than once. The yield of lucern shows a falling off in average yield per acre by about one-third over that of last year on account of a large area being brought under cultivation from the mid-year. Other fodder crops have yielded more or less the same as in the previous year at a cost of 6.5 annas per 100 lbs. of green fodder. There was besides about 50 acres suitable for grazing.

D. Aid and Assistance to the Public

15. *Supply of Implements.*—Owing to the spread of private enterprise, the sale of Agricultural implements has been discontinued in this section. Yet demands for implements, which are not kept for sale by firms, such as cotton hand gins, turmeric polishers, Manjri tooth cultivators, improved yokes, country seed drills, stone rollers for threshing jawar amounting in all to 12 indents were arranged to be supplied to the public or semi public institutions of this and other provinces of India. Over two hundred enquiries about different kinds of implements were also directed to the proper sources.

16. *Supply of Seeds.*—The seed supply mainly consisted of early groundnuts, N. R. cotton, *nilwa jawar*, *bajri* and vegetable seeds involving in all 166 indents. One hundred and forty-one correspondents enquiring about seeds which were not available on this farm were advised as to the reliable sources.

17. Labour, material and advice were given to the extent possible to the other sections of the college in the matter of the cultivation of crops, testing of implements and the like in their investigations, when asked for.

18. *Supply of Information.*—In all 181 enquiries on various agricultural matters were dealt with by correspondence and over 200 parties of visitors were attended to.

Publications.—The following leaflets were prepared for publication :—

- (1) Cultivation of chillies.
- (2) Cultivation of lucerne.
- (3) Cultivation of guinea grass.
- (4) Cultivation of onions.
- (5) Preservation of seeds.

The following articles were sent for publication in the Poona Agricultural College Magazine.

- (1) Food supply of Bombay Presidency by Messrs. K. S. Kulkarny and H. M. Desai.
- (2) A study of a farm in cotton tract in South Gujarat by Professor B. S. Patel and Mr. H. M. Desai.

Personal

19. Every member of the staff put in the best of his endeavour and ability in carrying out his duties.

V. G. GOKHALE,
Professor of Agriculture.

APPENDIX J

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL CHEMIST
TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE
YEAR 1928-29

During the year under report I was in charge of the Office and the Laboratory of the Agricultural Chemist to the Government of Bombay throughout the year.

2. The work of the Agricultural Chemist may be conveniently divided into five sections as under :—

- (a) Analytical work done for the public and for the various sections of the Agricultural Department and other Government Departments and for the public.
- (b) Investigation work.
- (c) Teaching at the Poona Agricultural College.
- (d) Water-finder work.
- (e) General.

(a) *Analytical Work*

3. The analytical work includes the actual analysis of the samples and also the advice given especially to the Public based on the analytical figures obtained. The analytical laboratory has gained great public faith and reputation and I am glad to say that the public are making the fullest use of the Laboratory.

4. The number of samples received for analysis continues to be as high as ever. In the year under report 1,294 samples were received. This number does not include samples analysed in connection with the research work carried on in the Chemical Laboratory. The classification of the samples shows that there were 335 soils, 243 manures, 109 waters, 179 feedings stuffs, 123 oilseeds and oils, 74 plants and parts of the plants, 164 Gul and molasses, etc., 15 dairy products and 42 miscellaneous.

5. The samples from Government Departments numbered 823. Many of these were analysed in connection with the various problems under investigation in the different sections of the Agricultural Department. Soil samples were analysed for the Professor of Agriculture in connection with the manurial plot experiments which he carried on, on the rabi jowar and onions in the last rabi season. Similarly for the Economic Botanist in his grass experiments, for the Soil Physicist in his dry-farming, for the Rice Specialist in his Rice Experiments, for the Salt land experiments at Arabhavi Farm and so on. A large number of soil samples were received this year from the Bijapur District. These samples were collected for the Museum of the Anti-famine Wilson Institute at Bijapur.

6. The manures consisted of the usual materials for use on the farm as also samples of synthetic farm-yard manures which are under experiments. A large number of leaves for manure were received from the Kumta Farm. Some samples of whole plants of rice, etc., were

analysed for the Rice Specialist and Soil-Physicist as they are studying the total quantities of the manurial constituents which different crops remove every year from the soils.

7. In connection with the experiments which the Economic Botanist is carrying on several samples of grasses and oilseeds were analysed. As in the previous year the economic botanist lent the services of one graduate for over a month to finish the analyses of oilseeds quickly. Several wheat samples were analysed for the crop Botanist and for the Botanist at Sakrand in connection with their selection work.

8. As in previous years a large number of samples came from actual cultivators and from men engaged in Agriculture or agricultural industries. The total number of samples received from private persons was 501. This shows that the agricultural public are making full use of the facilities offered to them by way of analysing their samples and giving advice which is so much needed by them. They very much appreciate this advice and the Chemical Laboratory continues to be popular. Out of the 501 samples, 52 were soils, 149 manures, 76 waters, 107 Gul, molasses, etc., 53 feeding stuffs and the remaining included dairy products, oilseeds, etc.

(b) Investigation Work

9. Investigation of small problems referred to the Agricultural Chemist is included under analytical work and it is the larger problems which need mention under the heading "Investigation" or "Research" work.

10. The study of the Indian buffalo-milk-casein was completed some-time ago and was sent for publication last year. It is being published in the Journal of Imperial Bureau of Animal Husbandry and Dairying. The first part appeared in the April number of the Journal and the second part is printed for inclusion in the July number.

11. The work on the Recuperation of Nitrogen in the Deccan soils was completed during the year under report as indicated in the last year's report. Similar investigation work is taken up with regard to the other important soils in the Presidency and it is expected that, that work will be completed during the next three or four months.

12. The experiments in connection with the manuring of rice are being conducted by the Rice Specialist at Karjat. I co-operate with the Rice Specialist in these experiments. An investigation of the assimilation of food by the rice plants was taken up by me as a side investigation. This was completed last year and published as a Departmental Bulletin under the title "Assimilation of food constituents by the Rice Plants."

13. A detailed study of the "Karl lands" in the Karnatic was taken up last year. During the year under report a good progress has been made and yet we feel we have only touched the fringe of the problem. It is a difficult problem and may take years for its solution. The investigation will be continued this year.

14. A study of the effect of Sodium-carbonate on Trap soils was started last year but could not be proceeded with on account of the pressure of other work. But it may, if possible, be taken up this year.

(c) *Teaching*

15. I am responsible for the teaching of Chemistry and Geology to all the classes at the Poona Agricultural College. The teaching work has become very heavy in recent years while the number of the staff has remained constant. Every body's hands are full. I am glad to say that every one of them even under these circumstances, is anxious to do some research work and utilizes fully his vacation and the spare hours that he may get during term time, to carry on research. Two students were working for the Master's degree in science in the Laboratory. One of them is studying Niger-seed oil while the other is studying the digestion of starch.

(d) *Water-finder Work*

16. There are four machines under me at work. Two of these are specially meant for Major Pogson—the Water-Diviner to the Government of Bombay. Each machine is in charge of an assistant. The two assistants meant for Major Pogson take readings on the sites located by him and send their reports to me. I then interpret the readings and send my predictions to Major Pogson. During the year under report Major Pogson located only a few sites and these were tested and reported upon. But the most important work of the assistants in charge of the water-finder machine is to locate sites for the public who apply for help. During the year under report 413 sites were tested for the people. The water-finder machines are becoming very popular.

(e) *General*

17. My section had its share in the Presidency Agricultural show of 1928 held at Ahmedabad. I was in charge of the "Soils and Fertilisers" Court and demonstrated Vinegar making and improved method of distilling essential oil. Professor V. G. Patwardhan was in charge of sugar-making and had to spend a period of over a month in connection with it.

18. During the year under report there was a severe frost at the end of the cold season in certain districts of the Bombay Presidency. The frost affected the sugarcane to such an extent in the Ahmednagar District that some of the people thought that the whole crop would be lost. Agriculturists found it extremely difficult to get proper type of *gul* out of the juice obtained from the frost affected cane. Mr. V. G. Patwardhan, Assistant Professor of Chemistry, was deputed to help the cultivators in preparing *gul*. Professor Patwardhan analysed the juice samples and demonstrated to the people how to get good *gul* out of the frost-affected cane juice by the judicious use of soda lime and Sajikhar (Sodium carbonate, bi-carbonate and sulphide) to neutralise excess of acidity and to

decolourise and the use of Bhendi juice to bring about proper clarification, etc. His help proved to be of great value in getting hard and crystalline *gul*. He carried on this work of helping the cultivators up to the 10th of April. His work was so much appreciated by the cultivators that they communicated their appreciation to the Department by passing a special resolution at one of their association meetings. Professor Patwardhan was helped by Mr. S. B. Shinde, District Agricultural Overseer, in his field work and by Mr. N. G. Apte of the Chemical Laboratory in his analytical and other laboratory work.

19. The Anti-Famine Wilson Institute Museum at Bijapur was opened in June. I supplied to this Museum samples of important soil forming minerals and rocks and also soils of the Bombay Presidency. I analysed a very large numbers of soils of the Bijapur District and sent one of my assistants to arrange all these samples in the Museum. At the time of the opening of the Museum an exhibition was held in which Vinegar-making and Essential oil distillation were demonstrated. Water-finder machine also was exhibited.

20. We have prepared a specially modified apparatus for the distillation of essential oils. It is economic and can extract the maximum quantity of the essential oil without in any way spoiling its quality. This process has attracted the attention of many people and several of them are going in for it.

Staff

21. I am glad to say that all the members of my staff worked satisfactorily. The teaching staff, the store-keeper, and the clerk are all over-worked due to increase of work all round. One additional post such as that of a curator will give relief partly to the office clerk and partly to the teaching staff.

D. L. SAHASRABUDDHE,

Agricultural Chemist to the Government of Bombay.

APPENDIX K

SUMMARY OF WORK DONE UNDER THE ECONOMIC BOTANIST TO
GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1928-29*Research*

The Economic Botanist has been allotted, by the Director of Agriculture, the duty of supervising all botanical work throughout the department. This work is mainly plant breeding. In the course of the year the Economic Botanist has toured to most of the experiment stations of the department to consult with the local plant breeders and other officers in charge of researches, and to help them with discussion and criticism. The Economic Botanist has also been the exponent of these researches on the Indian Central Cotton Committee, particularly of such work as is directly or indirectly financed by that body. Apart from the benefit to the actual researches, the wide survey of botanical work thus gained has been of great value to the Economic Botanist in his teaching (especially of the students taking advanced plant breeding) and has also opened up several lines of possible development in the modern application of statistics to field experiment. The need however, for a special officer to supervise all work on cotton, stressed by the Director of Agriculture in last year's report, is very urgent, for the Economic Botanist can give to cotton research only a fraction of the attention actually required.

2. Of the researches actually carried on by the Economic Botanist's own personal staff, the work on the breeding of bajri (*Pennisetum typ hoideum*) is the most important. This work is financed by the Sassoon David Trust. Out of the seven promising varieties under trial, Nos. 54 and 59 have for two years given consistently good results in the accurate system of testing known as the "Chessboard" method. No. 37 also continues to do well. None of these high-yielding varieties are however, markedly different in *appearance* from the ordinary bajri crop. We need something recognisably different before we start seed distribution. Our problem, therefore, narrows down to this :—

From the seven high-yielding varieties now available to produce one with a very high-yield and distinct in appearance from the ordinary crop.

We propose to do this by breeding colour into the stems of one or more of the varieties and from these evolving one final coloured-stemmed high-yielding type. The work is slow, as bajri is usually much cross-pollinated in field conditions, but we are hopeful of good results in the long run. The work of breeding a better bajri for Gujarat, and the improvement of Khandesh bajri are being co-ordinated with the Poona work under the Economic Botanist.

3. The grass research has yielded results that cannot be better expressed than in the final paragraph of the second memoir published on this research. It runs as follows :—

“To sum up : contour bunding, fencing, limitation of the number of cattle, keeping these cattle off the land in the early monsoon, provision of easily accessible drinking water and rock salt, and tree planting for shade are the measures needful to improve poor grassland. To get the maximum outturn from good grassland there should be the liberal manufacture of silage early in the season, followed by rotational grazing by a limited number of animals, whose droppings should be harrowed into the soil and reinforced if necessary by artificial manure. For dry grass production, cutting during or as soon after flowering as possible gives the best product. We recognise this must be, in many areas, a counsel of perfection, but it is worth aiming at. The increase of undesirable species or the reduction of desirable species should be at once the object of a special investigation.”

The economic side of grass production is now being studied with a view to seeing how these improvements can be introduced as factors in practical farming.

4. The work on castor has advanced one stage further, the number of varieties under study having now been reduced to 25. Analyses for oil content have again been made, and those varieties showing two continuous years of high oil-content are being tested for this for a third and also for yield. Part of the work is to be transferred to Nadiad.

5. The work on Safflower has been dropped, as the No. 7 variety was not definitely superior to local either in yield or oil content. The Lantana research has resulted in one final experiment in which an area of five acres of Lantana was treated, the tools used for cutting were secateurs and saws and arsenic was applied as before. The observations as to the results of treatment will have to be made about the end of the monsoon.

Teaching

The Economic Botanist and certain of his staff carried out as usual the duties of teaching botany, seed testing, ecology and genetics to the students of the College. One student was taken for M. Sc. work.

General

The number of samples reported on was 363, and the number of specimens identified 303. The Economic Botanist has also supplied specimens to Mr. Sampson, Economic Botanist at Kew, who is classifying jowar varieties.

Publications

The following publications by the Economic Botanist or his staff appeared during the year :

No.	Title of work.	Where published.	Authors.
1	Further studies of Indian Grasses and Grasslands.	Memoirs of the Agricultural Department in India (Botanical Series), Vol. XVI, No. 4, 1928.	W. Burns. L. B. Kulkarni. & S. R. Godbole.
2	Revision of Gammie's Field and Orchard Crops of the Bombay Presidency.	Bombay Department of Agricultural Bulletin, No. 4 of 1929.	G. B. Patwardhan
3	Arbor Day.	Agricultural College Magazine, Vol. XX, No. 4.	L. B. Kulkarni.
4	Lawns for sport; their construction and Upkeep.	Agricultural College Magazine, Vol. XX, No. 2, 1928.	S. R. Godbole.
5	An Ever-Bearing Mango	Agricultural College Magazine, Vol. XX, No. 1.	R. B. Deshpande.
6	Longevity of crop seeds	Agricultural Journal of India, July 1928.	K. M. Sonavane.

W. BURNS,

Economic Botanist to Government, Bombay.

APPENDIX I

SUMMARY OF WORK DONE UNDER THE CROP BOTANIST TO GOVERNMENT,
BOMBAY, POONA, FOR THE YEAR 1928-1929

The summary is divided into the following sections for the convenience of presentation :—

- I. Administration.
- II. Rice Breeding Investigations.
- III. Wheat Breeding Investigations.
- IV. Miscellaneous Activities.
- V. Programme for the next year.

I.—Administration

Mr. S. G. Bhalerao continued to hold charge of the post throughout the year and the report now submitted is almost such as has been written by him in a much more detailed form. Many of the staff members, however, were on leave for different periods. Mr. V. L. Bhosekar, Superintendent, Rice Breeding Station, Karjat, was on sick-leave from September 1928 to the end of the year. Mr. B. Nazareth, Superintendent, Wheat Breeding Station, Kirkee, was on leave for a month and a half. Mr. S. M. Patel, a new graduate, has been entertained in the leave vacancy of Mr. Bhosekar. Leave taking, particularly by the members of the Karjat staff, is occasioned by the very damp and taxing conditions of work prevailing there. With such exceptions caused by the conditions mentioned above, it is a pleasure to record that co-operation from the staff is quite satisfactory. Efforts to remove the Wheat Breeding Station to its own tract in the Nasik District are yet being made. Some expansion of the Rice Breeding Station, Karjat, to accommodate the additional working of the Bhadas and Zinya Kolamba is also needed and is being thought of.

II.—Rice Breeding Investigations

1. *The Season*.—The season for the rice crop, in the year under report, was somewhat defective in that, there was a shortage of rains for timely transplantation. Transplanting had some how, to be finished before the 30th July ; but the check that the seedlings received was more than could be made up during the remaining period of growth. The season had, however, a peculiar influence on crop-growth in that there was proportionately larger growth of straw than of grain on account of a steady rainfall that followed, as would be seen from the figures below :—

Table No. 1 showing the proportion of straw to grain of Strain No. 42

Years	1925-26	1926-27	1927-28	Average of the last 5 years	1928-29
Proportion of straw to grain..	0·89	0·72	0·89	0·87	1·37

2. *Behaviour of the Standard Strains.*—Strain No. K79 early, was put under intensive study, in order to ascertain its purity for several of its characters. The figures that could be obtained show that since the year 1924, when it was studied intensively last time, it has been maintained in pure form, by selfing year after year, although no study as such was undertaken during the last four years.

Strain Nos. K42 and K226.—These two late strains that are spreading in the tract have also been maintaining their purity to several of their characters including yield per plant as will be seen from the table below :—

Table No. 2 showing constancy in the behaviour of Strain Nos. K42 and K226 as indicated by yield per plant in the intensive series

Strain No.	1925-26	1926-27	1927-28	Average of the last 5 years	1928-29
K42	35.98	26.08	31.26	31.80	26.78
K226	39.20	27.90	30.54	32.12	27.80

It will be observed that the low yield per plant in 1926-27 and 1928-29 is some what in proportion of the low yield in the seasonal check plot in these years. In other words, it is mostly due to seasonal variations.

Besides, these two strains also occupy the top most place in the list of several sister-cultures that were studied intensively along with them as will be seen from the table below :—

Table No. 3 showing the comparative performance of the several strains studied intensively

Strain No.	42	226	225	39	Remarks
Yield per plant ..	26.74	27.80	23.04	25.82	

3. *Result of selection within pure lines.*—An effort was made this year to do selection within pure lines with the object of seeing whether the so-called pure lines were to any extent impure and would consequently benefit by selection. The figures collected for the purpose were highly instructive in that they clearly pointed out to the necessity

of continuing selections from even the so-called pure lines, for the plain reason that the so-called purity of a type for such a complex character as yield under the common field conditions, is hard for accurate determinations.

4. *Popularity and Spread of Strains.*—Strain No. 79 is spreading on high-lying lands round Palghar, in the Thana District and it is being recognised as a good substitute for the local variety "Jirboti." It is about 5 per cent. better than Jirboti in yield and commands better rates in the market, to the extent of Rs. 5 to Rs. 10 per Khandi (1,500 lbs.) which may be taken as an average crop per acre for the early varieties. In the Pardi Taluka of Surat District it is a better substitute for the local "Kada" variety, and hence it is spreading there also.

Strain No. 42 is commanding appreciation as usual. To start with it may be mentioned that in the Nasik District, it is not doing well, nor is there any favourable report about its behaviour from the Satara District. But from the rest of the tract, reports about its behaviour are very encouraging. The rice growing parts of the Nagar District do seem to want it. In Gujarath there is a demand for it, both from the Ahmedabad District and Baroda State. In Kolaba it is going on at its usual rate of expansion. The appreciation has gone beyond the cultivating public to the Rice Merchants and Mill-owners who admit that, from the tract in which Strain No. 42 is under cultivation, for the last five years or more, stuff of a high uniform quality known as farm Kolamba, and free from red kernels or other varietal admixtures, is coming up to the door of the mills, in large quantities, and is being paid for at an appreciably higher rate than was the case with the local paddy.

Strain No. 226 is having, again, as much appreciation in parts of North Thana and its cultivation is spreading there rapidly. There is no doubt it will establish itself there.

5. *New Developments—(a) by selection.*—Strain No. 79 early, referred to already, could be a very popular strain at Ratnagiri, if it did not suffer from the storage pest that it does. A substitute for it, has therefore, been found in a selection, No. K184, which ripens the same as the strain No. K79; and though it yields about 5 per cent. less than that, still it has a much finer grain (64.91 grains per gram) which is just the same as the fineness of the standard strain No. K42, when K79 is as coarse as to have 52 grains per gram. A careful study showed that it had a much less attack from the storage-pest, 4 per cent. against 21 per cent. for strain No. K79 and hence this strain may prove a suitable substitute for strain No. 79 where the susceptibility to a storage moth of the latter is constituting its chief defect.

(b) *By Hybridisation.*—The hybridisation work commenced by Mr. R. K. Bhide has been in its F₅ generation, in the year under report and is being brought to a head in the form of the following new types

that seem to have some significant future in the tract. Their chief features are described here below :—

Table No. 4 giving information of certain new Kolamba Isolations from the hybridisation series. Intensive series in single planting at 18" × 8"

Original Nos	Cross No. 10 K39 × K164	Cross No. 12 K164 × K39	Cross No. 15 K O.37 × K39
	342—51—40	349—84—15	371—10—89
Registered as Strain No.	401	406	412
Tillering	8.35	7.48	6.59
Panicle length	22.66	21.37	23.06
Flowering date	14th Sep- tember.	20th Sep- tember.	6th Octo- ber.
Per plant yield (grain)	17.37	21.51	26.81
No. of grains per gram	*87.68	*85.35	*81.41

* The fineness of the standard late St. No. 42 is 68 grains per gram.

Strain No. 401 is thus an intermediate strain that is ready for harvest by about 15th of October, i.e., about 15 days earlier than the late Kolamba crop. Its additional peculiarity is its very fine grain which commands a very high price in the market. This should be a very good substitute for the coarse rice that are generally grown on high lands. There is no local rice so early and so fine in grain-size, as this and hence the comparative yielding capacity of this strain cannot be stated.

Strain No. 406.—This is another selection that would mature about a week later than the strain No. 401 just mentioned. Its grain is fine as strain No. 401 and it is besides, better in yield than that. This can cover certain lands which retain water somewhat late than those for which Strain No. 401 is suited. No statement as regards the comparative yielding capacity of this strain can be made for the same reasons as have been mentioned against Strain No. 401.

Strain No. 412.—This strain matures just the same time as Strain No. 42, so it can be harvested along with it in the harvesting season of the late Kolambas. Its grain is much finer than that of the Strain No. 42. Its yielding capacity seems to be about 7 per cent. less than that of Strain No. 42 as ascertained under replications, its peculiar feature, however, is its thick stem, which ensures it against lodging, and hence it need not mind if its harvest is delayed by a number of days.

The rest of the cultures obtained out of the crosses and studied up to the year under report may briefly be summarised as under as regards their present position and probable future.

Table No. 5 giving briefly an account of the status of the several other cultures studied intensively in the year 1928-29

Strain No. (Culture No.)	Registered Strain No.	Behaviour in 1928-29	Disposal
6-36-56 ..	404	Impure for grain size ..	Discontinued as impure and inferior to 401.
6-36-36 ..	405	Impure for dates of flowering.	Discontinued as impure and inferior to 401.
10-342-51	401	Pure for many characters ..	Selected for further propagation.
10-342-54 ..	402	Pure for many characters ..	Reserved as 2nd to 401 although some what different from and inferior to it.
10-709-49 ..	403	Impure for grain size and date of flowering, yet high in yield.	Proposed for further study and purification.
12-349-84 ..	406	Pure for many characters ..	Selected for further propagation.
15-371-10 ..	412	Pure for many characters ..	Selected for further propagation.
16-418-25 ..	410	Panicles highly sterile at top ..	Rejected as undesirable.
16-725-16 ..	411	Panicles highly sterile at top	Rejected as undesirable.
36-950 ..	407	Impure for date of flowering	Discontinued as unprofitable.
36-769 ..	..	Not studied as a coarse grain-grained type.	Discontinued as a very coarse grained type.
36-531 ..	408	Impure for date of flowering and grain size.	Discontinued as impure.
36-516 ..	413	Pure but lesser in yield than Strain No. 42.	Discontinued as unprofitable.
36-932 ..	..	Not studied as a coarse grain-ed late type.	Discontinued as a very late and coarse grain-ed type.
36-596 ..	409	Impure for grain size ..	Discontinued as unprofitable.
16-291-50 ..	414	Red sheathed pure ..	Proposed for multiplication in the Southern Division.

Other developments out of specially crosses Nos. 48 and 50 referred to in the last Annual Report are yet under completion, and hence no detailed mention of them is made here.

F2 Generation.—Further crosses Nos. 51 and 54 reported to be in F1 generation, in the last Annual Report, have been studied each to the extent of about 1,000 plants and about 10 fine, slender grained and high yielding selections, therefrom, particularly from cross No. 54, between K266 and K164 would be studied in the ensuing year.

F1 Generation.—Additional crossing had been undertaken with the object of studying the inheritance of certain rice characters. About 16 different pairs each for some important pair of allelomorphs were

crossed and the successful hybrid plants were studied, in the year under report, along with the parents. The study is being presented in the form of a publication embodying therein the results of hybridisation done from 1923 to 1928.

6. *Additional Items of Work.*—It might be stated that the Zinya variety of the Northern Talukas of the Thana District has been taken up for selection. All the selected cultures taken collectively, show an improvement of about 12 per cent. over the local although there are just a few biotypic differences, out of them some 12 line cultures of the same have been intensively studied for a number of characters. Most of them are pure and a selected lot of the following cultures is proposed for further study both in the intensive series and under replication along with the local seed of the Zinya variety :—

Z—44, 81, 111, 117, 129.

Similar study of the line cultures of the Bhadas variety of the Western Kolaba Talukas has also been under execution. The selected cultures in this case show in aggregate an improvement of only 5 per cent. over the local, although the variety is rich in biotypes and out of them the following 6 cultures are proposed for further study both in the intensive and under replication :—

B—52, 211, 219, 351, 364, 377.

III.—Wheat-Breeding Investigations

The season.—The season for the wheat cultures grown at the Ganeshkhind Botanical Gardens, Kirkee, was once more unfavourable. This year it was the temperature that affected the crop more than moisture or rains. There was practically no cold till 16th of December. The temperature was (1) Minimum 50 and (2) Maximum 90. Consequently the crop was forced up in flowering by about 3 weeks earlier than its usual time. Subsequently, however, with the exception of a very low cold for three days, the season continued uncertain and yet highly favourable for the development of rust, with the result that almost every form of wheat and even the well-known rust-resistant Pusa4, and Khapli also suffered from the attack of rust. Besides, the rust occurred more under dry conditions than under irrigation in certain cases. The comparative experimental value of the Wheat-Breeding Investigations is, therefore, greatly reduced, what is, however, attempted herebelow is to sketch out certain facts of scientific and practical importance that stand true irrespective of the vagaries of the season :

1. *The high-yielding selections.*—Till to the end of the year 1927-28, three strains, viz., No. 168, 162 and 224 were regarded as of prime importance. In the year under report another strain No. 103 seem additionally worth taking note of. It might at the same time be remarked that Strain No. 168 though rather an early strain is not likely to be very popular on account of its rather low yield except in certain places. Then again Strain No. 224 has also a limited use, in certain parts of Gujarath and round Jalgaon in East Khandesh. The remaining two strains

Nos. 162 and 103 are closely in competition with each other, and either of them would finally be established in the Bansī tract. The behaviour of these strains under replication is given below :—

Table No. 1 giving the results of replications of the selected strains with the local

Strain No.	Mean yield per replication in gram	Percentage of superiority	Difference	Remarks
162 ..	1142 + 45.5	Local 5 per cent. superior.	0.9 in favour of local.	The plot for Strain Nos. 162 and 103 with their locals were different and hence the difference in the yield of the local.
Local ..	1210 + 36.6			
103 ..	1797 + 49.8	Strain No. 103 10 per cent. superior.	1.8 in favour of Strain No. 103.	
Local ..	1610 + 49.3			

All the same, the attack of rust is responsible for the considerably low yield of the selected strains in comparison with the local and hence the figures given above have no real but only a vitiated significance.

2. *Selections from the Deshi Variety of the Poona District.*—Mention may next be made of certain selections from the wheat crop of Charoli near Poona, which represented the so-called Deshi Variety of the Poona District. These selections were in the line culture stage in the year 1927-28, and the most promising of them were compared with the local seed from Charoli, under replication in the year under report. The trials indicate that there have been some four selections, that have some merits as shown in the table below :—

Table No. 2 showing the important characters of certain promising selections from the Deshi Variety of Poona District

Strain No.	Date of flowering	Percentage of superiority over local 1927-28	Percentage of superiority over local 1928-29	Remarks
681 ..	19th December.	30	Nil.	Flowers earlier by 11 days than local.
619 ..	24th December.	30	9.7	Good grain quality.
635 ..	30th December.	30	29.0	A dwarf late type.
683 ..	2nd January ..	2	17.0	Late even.
Local ..	30th December.	....	....	

These would be further compared with the local on a large scale next year.

The following two strains again that showed great promise under line culture last year have continued to give the same promise this year, in

the intensive series, although they have not done so well under replications. :—

Table No. 3 showing the percentage superiority of certain selections over the local

Strain No.	Under line culture in 1927-28	Under intensive study in 1928-29	Under replication in 1928-29
	Per cent.	Per cent.	Per cent.
665	34	33	5
678	24	22	6

These strains would be studied further next year to bring about their real value.

The 100 selections that were studied in 1927-28 were subsequently reduced down to 14 on the basis of high yield, and were studied under line culture once more in the year under report. Most of them were early in ripening in comparison with Strain No. 162. In respect of yield, however, only the following five of them showed improvement over the local, and hence they would be studied more in detail next year :—

Table No. 4 showing per plant behaviour of some additional promising strains from the Bansi Wheat

Strain No.	Date of flowering	Tillering mean	Panicle length	Yield per plant	Remarks
162/1 ..	4th January.	8.53	8.12	8.05	With the exception of the one general irrigation at the early stage, these cultures were under dry condition and hence have not suffered much from rust.
706 ..	8th January.	8.20	7.81	<u>9.75</u>	
714 ..	28th Decem-ber.	8.94	7.83	<u>9.14</u>	
715 ..	31st Decem-ber.	8.55	7.98	<u>9.73</u>	
733 ..	30th Decem-ber.	8.08	7.33	<u>8.14</u>	
734 ..	30th Decem-ber.	8.70	7.51	<u>8.67</u>	
162/2 ..	5th January.	8.39	7.59	7.21	

Selections from the Bhal Wheat.—In all 74 selections were studied in the line cultures with strain No. 162 as checks. The samples show great variations for a number of characters. The grain is markedly superior to Bansi in that it is very thick and plump. Under line culture they showed some superiority over even the standard strain No. 162. The figures are not reproduced here as they are so far true only on a single line basis which cannot be taken in any way as much reliable. Their

susceptibility to rust is as great as that of the Bansi type. It is, however, felt that any further working with them in this tract would be of no much use in so far as the soils of the two tracts differ in respect of their salt contents those of the Bhal tract being highly saline—and hence it may not seem possible to continue working with them.

Extension of work to the Baxi Variety of the Nagar District.—Selections have been undertaken from the Baxi wheat of the Nagar District with the object of supplying that tract with pure seed of the best quality, the local seed though generally of a high quality, being found to have varietal admixtures and bio-types within the same variety, which breaks the uniformity in appearance and consequently lowers the yield. Besides the variety is such as suffers from rust to an appreciable extent and requires improvement particularly on that side.

Breeding for Rust Resistance.—The cultures mentioned as rust resistant in the last year's report were further tested in 1928-29. A varying number of selections from each according to the individual culture was made, and they were grown in separate lines in order just to see whether the progeny of the individual plants obtained from each culture was behaving uniformly. This test brought out certain points of diversity or impurity in some of the cultures. Consequently it became necessary to study the individual lines for their purity again in the year under report. This has the effect in multiplying the original culture in some of its sub-cultures. The important features of all of them had been their very high degree of resistance to rust, which may be said to be almost as much as that of Khapli parent while they had all of them the superior grain quality of the Bansi parent. The leading types of the description are given below with some details about them :—

Table No. 5 showing the rust resistant cultures of 1928-29

Strain No.				Date of flowering	Per plant yield in grams	Rust Per cent.
Khapli	..	..	..	15th January ..	14.22	2—5
168	..	..	..	21st December ..	8.47	75—80
801-17	..	..	..	6th January ..	5.65	15—20
802-84	..	..	..	1st January ..	6.66	15—20
803-77	..	..	..	13th December.	8.70	5—10
804-14	..	..	..	19th December.	11.09	5—10
805-56	..	..	..	15th December.	7.54	5—10
806-144	..	..	..	17th December.	10.52	5—10
807-126	..	..	..	17th December.	10.37	5—10
808-143	..	..	..	16th December.	9.10	5—10
809-49	..	..	..	18th December.	10.60	5—10
810-138	..	..	..	17th December.	11.00	5—10

The scheme of laying out these cultures in the field consisted of 4 rows of the resistant cultures followed by one row of the susceptible Bansi

No. 162 which also acted as a local check together with the Bansi parent No. 163 occurring at the border at either ends. These Bansi types, as already pointed out, were suffering heavily from rust and thus there was no difficulty whatever about the source of infection. Under such conditions as these the amount of attack of rust on the selected cultures and on the susceptible ones had been what is recorded above. It clearly speaks for their high degree of resistance. For a time, however, it appeared that the rust resistance that was indicated by these cultures was only due to their advanced maturity, and consequent escape from rust rather than any thing like an inherent capacity to resist the attack of the rust fungus nor can any definite statement in this respect be made even now, until and unless the so-called rust resistance is experimentally tested by actual artificial infection. Yet, the fact that a number of cultures early intermediate, and late, in flowering or maturity, obtained from the hybridisation-lot did escape rust as would be seen from the table given below, should indicate that, the cultures under reference have in them the hereditary capacity to resist rust inherited from their resistant Khapli parent.

Table No. 6 showing cultures flowering at different times during the season and yet escaping rust

Culture No.	Date of flowering	Percentage of rust attack	Remarks
Khapli	16th January ..	2—5	Parent (Female).
168	26th December ..	75—80	.. (Male).
Progeny 803-143 ..	6th December ..	5—10	Culture studied in "A" plot.
804-73	14th December ..	5—10	Culture studied in "A" plot.
809-49	18th December ..	5—10	
3-33-38	22nd December ..	2—5	Culture grown in "B" plot.
3-33-142	29th December ..	2—5	Do.
3-79-120	8th January ..	2—5	Do.
3-33-84	12th January ..	2—5	Do.
3-31-120	15th January ..	2—5	Do.
3-6-47	17th January ..	2—5	Do.

The same conclusion can further be strengthened from another observation, viz., there have been certain other cultures, 801, 802 and 803, which although they flowered at the same time (6-1) as the cultures mentioned above suffered appreciably from rust to the extent of 15-20 per cent. while their sister cultures referred to already did not suffer so much. This clearly proves the differences in the degree of inheritance of the character of rust resistance, and hence those cultures that did show resistance to rust can be taken as inherently resistant so far to it, and may therefore be relied on to breed true to that character in future.

IV.—Miscellaneous Activities

The Rice Breeding Work at Mugad in the Southern Division and same at Ratnagiri were visited by Mr. Bhalerao, during the course of the year. In the Southern Division certain rice strains isolated at the Rice Breeding Station, have now become well established in the tract and are appreciated by the cultivators as giving higher yields than their own local seed. Similarly at Ratnagiri there are one or two strains that are finding favour with the public.

Participation in the organisation of the Research section in the Presidency Agricultural Show was done.

Two radio talks were also broadcasted by him, one dealing with cereal breeding in general and another with Rice breeding in particular.

R. K. KULKARNI,

Acting Crop Botanist to the Government of Bombay,
Poona.

APPENDIX M

SUMMARY OF WORK DONE UNDER THE PLANT PATHOLOGIST TO
GOVERNMENT, BOMBAY PRESIDENCY, POONA,
FOR THE YEAR 1928-29

During the year under report Dr. B. N. Uppal held the charge of the Section of Plant Pathology.

Mr. M. N. Kamat continued to act as Assistant Professor of Mycology throughout the year except for the brief period, viz., from 7th April to 26th May 1929, when he was on leave. The post was not held by anybody during this period; but a special post of Graduate Assistant was created, and Mr. L. G. Kulkarni was appointed to it.

Mr. J. S. Malelu acted as Assistant Mycologist until 15th December 1928, when he was transferred to Bassein to take charge of a special appointment of the betel vine Investigator in the second grade (150—5—200), created temporarily by Government to make a careful investigation into the wilt of betel vines caused by *Sclerotium rolfsii*. Mr. L. G. Kulkarni acted as Assistant Mycologist for some time, and finally Mr. M. K. Desai was appointed to act in the post.

Education

The Plant Pathologist to Government was assisted by the Assistant Professor of Mycology and the Assistant Mycologist in the teaching of Plant Pathology at the College of Agriculture, Poona.

There were three students specialising for the degree course in Advanced Plant Pathology, and all of them were successful in the B.Ag. examination. Besides, there was one Graduate Assistant deputed by the Deputy Director of Agriculture, Sind, to undergo training in Advanced Plant Pathology. Considering the strength of the staff, the teaching work was very heavy; but I am glad to say that the work was satisfactorily done, although a large programme of research work was undertaken by the section. I may repeat here that some more assistance has become necessary in order that the progress in research may continue to be satisfactory.

There was one post-graduate student under training throughout the year. He is working on the mosaic disease of chillies. At the end of the year, two students (one of them from the Madras Presidency) applied for admission to the post-graduate course in mycology; but on account of limited facilities available, they were refused admission.

Research

In spite of the heavy duties of teaching and advisory work, the members of the staff have had another successful year as regards research. The results of the investigations are both of scientific and practical value. There are now ten problems under investigation, and we are finding it very difficult to carry out the research programme with the present staff. It is hoped that some assistance will soon be given so that we may

continue to do useful work for the Bombay cultivators. I take this opportunity of complimenting the members of my staff and the student engaged in research, for the valuable work done during the year.

1. *Sulphur Treatment for Grape Vine Mildew*.—Large-scale trials were made to ascertain as to how far adulteration of sulphur was possible without deteriorating its fungicidal value. The inert substances used were : (1) Lime, (2) gypsum and (3) cement. The results of these experiments show that adulteration up to 20 per cent. of the weight of sulphur has no ill effects on the fungicidal value of sulphur.

The sulphur treatment has given excellent results in mildew control and is much appreciated by grape growers. Mr. H. P. Paranjpye, District Horticultural Officer, thinks that it has given a great stimulus to the extension of grape cultivation in the Bombay Presidency, and bids fair to make grape cultivation a very profitable industry.

The experimental study on the control of grape mildew has been completed, and the results are being prepared for publication in a Departmental bulletin.

2. *Control of Jowar Smut*.—After it has been shown that the treatment of smutted jowar seed with sulphur was the cheapest and the most convenient remedy for the control of smut, it was decided to conduct district trials in the Southern, South Central and North Central divisions, in collaboration with the Deputy Directors of these divisions. In these trials, very effective control of smut was secured when the seed was treated with sulphur at the rate of 4-5 ounces of the dust per 60 lbs. of seed. The sulphur treatment will revolutionise our method of smut control, since a cultivator who hesitated to steep his seed in copper-sulphate solution because of the inconveniences involved in the treatment, can conveniently practise the dust treatment. The cost of the new treatment is less than *one pie per acre*; and sulphur-dusted seed if not used for sowing, can be fed to cattle without any ill effects.

The Collector of Bijapur also carried out extensive trials on the new treatment and found it very satisfactory. He is now advocating this treatment for the control of jowar smut.

It has been decided by the Director of Agriculture, Bombay, that the sulphur packets should replace the copper-sulphate packets, and that the propaganda on the sulphur treatment should be pushed on vigorously.

3. *Control of Jiru Mildew*.—Powdery mildew of jiru is a very serious disease of this crop in Gujarat. Some years ago, spraying with Bordeaux mixture was tried for controlling this disease, but was not found effective. Experiments were made last year with sulphur dusting. The work was done at Boriavi, near Nadiad, in collaboration with the Deputy Director of Agriculture, Gujarat. Mr. C. M. Upadhyaya, District Agricultural Overseer, Nadiad, rendered valuable assistance in making the trials. No results could be obtained as the experimental plots were damaged by frost. However, the disease was noticed in a control plot before the frost, whereas the treated plots were free from the disease.

The dusting will be tested again next year.

4. *Control of fig Rust*.—Fig rust, caused by *Uredo fici*, is a very serious disease of this crop. It causes defoliation which results in reduced yield. In 1925-26, spraying with Bordeaux mixture was tried to control this disease; but the results were inconclusive. Last year, three fungicides were used: Self-boiled lime sulphur, 200-mesh fine sulphur; and lime sulphur dust (mixed in equal proportions). Of all the treatments, sulphur dusting was found very effective in controlling the disease, and caused very slight injury to the leaves. Lime sulphur wash was ineffective and also caused injury to leaves and fruit. Lime sulphur dust was fairly effective.

Trials on sulphur dusting will be continued next year, to determine the number of applications for controlling the disease and the cost of the treatment.

5. *Infection and Cross-inoculation Studies on Jowar and Bajri with the Fungus causing Downy Mildew*.—It was reported last year that young bajri plants could be artificially infected with oospores of *Sclerospora graminicola*; but all attempts to secure artificial infection of jowar plants with the oospores of *S. graminicola* var. *Andropogonis-sorghii*, failed. It can now be stated that infection of jowar plants has been secured under controlled conditions. In a saturated atmosphere, sporulation has been found to occur at 25°C. The conidia did not germinate at 11-12°C; but there was profuse germination at 15°C.

We have also been able to infect bajri with the oospores of the fungus on jowar; but when jowar was exposed to infection by the oospores of the fungus on bajri, infection was secured in only one case. However, with the oospore material collected on *Setaria viridis* in America, both bajri and jowar were easily infected.

Studies on cross-inoculation and biometrical measurements of the conidia of the different species of *Sclerospora* are now being made.

6. *Gummosis of Citrus Trees*.—It was found that the sweet varieties of citrus were completely susceptible to gummosis, while the sour varieties such as the orange (santra), the lime and some of the wild varieties, viz., jamburi were extremely resistant. In the case of the budded sweet varieties, the stock was resistant and infection could take place at or above the bud-joint. When the plants were artificially infected, the oozing-out of the gum was noticed usually after ten days; but the exudation became very marked after twenty days.

Extensive field trials were made on the treatment of gum-affected trees with zulite, florim, creosote and carbolic acid. The final results are not yet available; but it seems that creosote will be a cheaper and a more convenient fungicide.

7. *Dry Rot of Potatoes*.—It was reported last year that *Fusarium radicola* and *F. cœruleum* can produce typical dry rot; but the symptoms of dry rot produced were not well developed, when *F. oxysporum* and *F. trichotheciodes* were used to inoculate the tubers. The effect of different humidities (1, 33, 65.5 and 100 per cent.) on the development of dry rot in tubers, was tried; but since there were no facilities to secure

controlled temperatures, the results of the experiments were erratic. It is proposed to suspend this work until an apparatus for controlling different temperatures is available for making the study.

8. *Mosaic Disease of Chillies*.—Extensive controlled experiments have conclusively shown that the disease, which shows itself in curling, mottling and reduced size of terminal leaves, is a type of virus disease known as mosaic. Healthy chilli plants were raised in insect-proof, muslin cages, and into each cage, a number of thrips were introduced on each plant. The plants exhibited the mosaic symptoms when 2-10 thrips were used to infest a plant. Following the experiments with thrips, transmission of the virus to healthy plants was effected by means of the juice from diseased plants. It has been proved that thrips are *not* the primary cause of the disease, but serve as vectors (carriers) of the virus. Mites have failed to transmit the virus from diseased to healthy plants.

Our work has cleared up the question of the casual agency of the obscure disease of chillies, which has been a subject of much discussion in this Presidency. Further work on this problem is being done.

9. *Sclerotium Wilt of Betel Vines*.—The wilt of betel vines, caused by *Sclerotium rolfsii*, was first reported in 1927 by the Agricultural Overseer, North Thana, Palghar. The disease became very serious in 1928, and the Plant Pathologist was asked by the Director of Agriculture, Bombay, to make a thorough survey of the betel vine gardens and submit a report on the extent of damage caused by this disease. The survey revealed a very serious position of the betel vine cultivation with respect to the disease, and the Government sanctioned a special appointment of the betel vine Investigator to make a thorough study of the whole disease problem.

Briefly stated, work on the following lines is being done :—

- (a) Host range of the fungus.
- (b) Physiology of the fungus.
- (c) Sources of natural infection.
- (d) Period of viability of sclerotia in the field.
- (e) Relation of depth of sclerotia in soil to infection.
- (f) Relation of different kinds of soils and soil moistures to infection and development of the fungus.
- (g) Control.
 - (i) Value of rotation in control.
 - (ii) Use of raw fish as manure and its relation to development of the disease.
 - (iii) Direct disinfection of soil around the bases of vines.

10. *Brown Spot Disease of Rice in Upper Sind*.—Experiments on seed-treatment for controlling the " rati " disease of rice were made at Government Farm, Larkana. The seed disinfectants used were : (1) Organic compounds of mercury such as semesan, germisan, uspulun, etc., (2) copper sulphate and (3) formaldehyde. The disease did not appear both in the treated and untreated plots, thus vitiating the experiment. It may be noted that the conditions for the development of the disease were unfavourable during the growing season, and the early sown varieties of

rice escaped the disease, with the result that the rice crop in 1928 was the best in the last ten years.

The experiments will be repeated next year.

Advisory work.—A large number of enquiries regarding plant diseases were received from the district officers of the Department and the public, and advice was given promptly whenever required.

Government have sanctioned the printing of the Bombay Plant Disease Survey forms to be used in making the disease survey of the Presidency. The work has already been started in some divisions, and we hope to publish every year the results of this survey in the Annual Report. This work, which was long over-due, would be very useful for an intelligent understanding of the disease position in the Presidency.

The section had to work hard in connection with the Pestology Court of the Ahmedabad Presidency Agricultural Show. It was, however, unfortunate that the Court was destroyed by fire on the opening day of the Show.

Our activities also embraced the following :—

- (i) Demonstrating the efficacy of sulphur dusting in the control of grape mildew in cultivators' gardens.
- (ii) Treating gummosis-affected citrus trees.
- (iii) Taking part in the District Agricultural Shows all over the Presidency.

Publications

- (i) Uppal, B. N. and Malelu, J. S.—

A preliminary report on experiments in the control of Grain Smut of jowar (*Andropogon sorghum*). *Agriculture Journal India* 23 : 471-472. 1928.

- (ii) Control of the Red Rot of Sugarcane, Bombay Department of Agriculture Leaflet No. 7. 1928.

- (iii) Control of the Powdery Mildew of Grape, Bombay Department of Agriculture Leaflet No. 6. 1928.

- (iv) Uppal, B. N. and Kamat, M. N.—

Artificial infection of *Pennisetum typhoideum* by *Sclerospora graminicola*. *Agriculture Journal India* 23 : 309-310. 1928.

- (v) Uppal, B. N.—

Fungous disease of the grape in the Bombay Presidency. *Internat. Revenue Agriculture N. S.*, xix, p. 745. 1928.

- (vi)—

Fungous disease of rice observed in the Bombay Presidency. *Internat. Revenue Agriculture, N. S.*, xix, p. 905. 1928.

(vii)—

Sclerotium rot of betel vine (*Piper betel*) in the Bombay Presidency, Internat. Revenue Agriculture, N. S., xix, p. 1976, 1928.

(viii)—

Notes on Diseases in the Bombay Presidency. Internat. Revenue Agriculture, N. S., xx, p. 33. 1929.

B. N. UPPAL,

Plant Pathologist to Government,
Bombay Presidency, Poona.

APPENDIX N

SUMMARY OF WORK DONE UNDER THE SOIL PHYSICIST TO GOVERNMENT,
BOMBAY, DURING THE YEAR 1928-29

The undersigned held charge of the post of the Soil Physicist to the Government of Bombay during the year under report and there was no change in the existing staff.

The problem of Dry Farming continues to be investigated in an intensive manner in the Laboratory and at the Experimental Station at Manjri, and in an extensive manner in the district. Additional Experiments were laid out at Manjri so as to enable us to properly assess the values to the different factors involved in the method of Dry Farming.

Season.—Water being the important limiting factor in Dry Farming, the season plays a great part in the successful operations in any year. The total annual rainfall at the Dry Farm amounted to 20·39 inches, which is slightly below the average rainfall of the station and when compared with the previous year, it falls short by nearly two inches. The number of rainy days in the year was 65, out of which 53 days were during the Kharip season till the 15th September and 12 days of rain were in the latter half of September and October giving the Rabi rains. The Kharip rainfall was 11·32 inches while the Rabi rains amounted to 9·07 inches. The distribution of Kharip rains was so even, during June, July and August, that the result was a poor season for Kharip crops. The sowing had to be done on insufficient moisture in the soil and this was not properly replenished during July and August which gave 2·53 and 2·91 inches of rain distributed over 19 and 22 days. The result was that no effect of stirring the soil to different depths was visible on Kharip crop for there was not sufficient moisture to be conserved by mulching.

But when we consider the late rains useful for Rabi Crops, we find that the total useful rainfall which could be stored from June to September, i.e., before germination amounted to 13·73 inches. During the rest of the growing period there was only 61 cents of rain of semi-useful nature during October while there was no further rain till the harvest time. It may therefore be said that yields of Rabi crop are obtained practically on the conserved moisture.

Experiments with Kharip Crops—(1) *Bajri and Tur Mixture.*—The general method of Dry Farming for Kharip and Rabi crops consists in ploughing the land with an iron plough in March or April, three to six harrowings before sowing, placing small bunds before rain, and giving four interculturings during the growth of the crop. The previous year's experiments to find, the effect of different depths of mulches, the effect of bunds, effect of organic matter, etc., were repeated this year. The results given in the tabular statement are calculated on acreage from the duplicate or triplicate plots of one guntha each. It would be seen that on account of the insufficient moisture at sowing time and the extreme distribution of rains during the growth of crop, no effect of mulching is visible during the year under report. The bunds do show advantage

over the flat plots varying from 11 to 40 per cent. On the whole the yields of Bajri and Tur obtained are far above the normal yields of the tract.

Other Kharip Crops.—Cotton, Nilwa Jowar as a fodder and maize were tried on a small scale with very encouraging results which indicate the possibilities of the application of Dry Farm methods to other crops.

Experiments with Rabi Jowar.—The Rabi Jowar being the most important crop in the districts liable to frequent famines receives greatest attention at the Dry Farm Experimental Station at Manjri and numerous experiments are laid out to elucidate information on various points involved in the successful growth of the crop under the climatic conditions of precarious and uncertain rains.

A large number of experiments replicated three times were carried out to find (a) the advantage of bunds over no-bund, (b) the advantage of mulch over no-mulch and the most suitable depth of the mulch, (c) the advantage of addition of organic matter or a fertilizer, (d) the best density of plant population, (e) the comparison of different depths of cultivation. To these was added a local method plot or a cultivator's plot. When we compare the yields obtained during the year under report with those of the previous year of favourable rain, we find that the yields of Jowar grain are as good as the previous year. The extra rain in 1927 only resulted in giving more fodder in some cases.

In addition to the above experiments, experiments were carried out to find (a) optimum time of sowing, (b) the depth to which the seed must be sown, (c) water-requirement of the Jowar crop on plot scale. The results obtained are so far of a qualitative nature and require further trials for definite indication.

Laboratory Work.—The very large number of experiments in the field does not allow much leisure for laboratory work for want of additional hands. Determinations of soil moistures at different periods of crop growth fully occupy the time of the very limited staff.

Dry-Farming Trials in the Districts.—The district work which was commenced on a small scale last year, was extended to an appreciable extent in the year under report, with the help of the Deputy Directors, S. C. D. and S. D. The results obtained at Ahmednagar and Talegaon-Dhamdhare are the most promising of all. Results at Mohol and Bijapur were affected by the incidence of stem-borer.

Interculturing Bullock-hoes.—The use of hand-hoes advocated till last year limits the area a cultivator can manage even if he were to take to it and hence two types of bullock-hoes were got made and have proved very successful in preparing and maintaining the necessary mulch. The introduction of these bullock-hoes, it is hoped, will bring the whole method of Dry Farming within the practical limits of the cultivators.

Propaganda Work—Demonstrations and Lectures.—Soil Physics and Dry-Farming sections were arranged at the three important Agricultural Shows during the year under report, viz., the Ahmedabad Presidency

Show, The Ahmednagar District Show and the Bijapur Agricultural Show.

More than eight lectures on Dry Farming with illustrations and experiments were given at different places in Ahmednagar, Bijapur, Sholapur and Poona districts and were attended by large number of interested and inquisitive cultivators.

Staff.—The large number of experiments at the Dry Farm Experimental Station occupies the whole of the time of the Soil Physicist and his two assistants, one graduate and the other non-graduate. In the ensuing year very important and interesting experiments are laid out to determine the surface Run-off and erosion but the present staff will not be able to cope adequately with all the work of these new additional experiments. Hence there is the most urgent need of more hands, at least one graduate and one non-graduate, to cope efficiently with the increasing responsibilities of the Research work at Manjri and the field work in the District.

N. V. KANITKAR,

Soil Physicist to the Government of Bombay.

(a) Statement showing the yields per acre of Bajri and Tur during 1928

	Bajri grain.	Fodder.	Tur Grain.
	Lbs.	Lbs.	Lbs.
Flat without bunds and kept unstirred ..	620	3,166	880
Flat without bunds and stirred 2" deep ..	502	4,195	660
Bunds and kept unstirred ..	868	2,000	550
Bunds and stirred 2" deep ..	558	2,257	650

(b) Statement showing the yields per acre of Rabi Jowar in 1928-29

	1927-28.		1928-29.	
	Total rainfall 22·03 inches.		Total rainfall 20·39 inches.	
	Grain.	Fodder.	Grain.	Fodder.
	Lbs.	Lbs.	Lbs.	Lbs.
Flat without bunds and kept unstirred ..	1,133	2,767	1,136	2,160
Bunds and kept unstirred ..	1,214	2,185	1,216	2,034
Bunds and stirred 2" deep ..	1,386	3,359	1,364	2,548
Bunds and stirred 3" deep ..	1,375	4,047	1,487	2,597
Addition of Sann as green manure ..	1,569	2,805	1,852	3,572
Farm yard manure, 8 cart-loads per acre.	1,590	2,716	1,492	2,816
Cultivator's plot ..	565	3,866	989	3,371

(c) Statement showing the yields per acre of Rabi Jowar of the Demonstration plots on Cultivators' fields during 1928-29

	Dry Farming Demonstration plots.		Local method plot.	
	Grain.	Fodder.	Grain.	Fodder.
	Lbs.	Lbs.	Lbs.	Lbs.
Ahmednagar ..	2,860	6,600	1,100	4,620
Talegaon-Dhamdhare (Poona District)				
Plot No. 1 ..	1,162	2,894	598	1,283
" 2 ..	955	3,292	777	2,825
" 3 ..	892	2,244	342	1,350
" 4 ..	459	1,293	178	768
Kedgaon (Mukti Mission) ..	640	1,750	400	1,000
Bijapur ..	562	586	487	697
Bagewadi ..	745	1,184	637	1,030
Mohol ..	470*	918*	525	1,104

*Plots were vitiated by severe stem-borer.

APPENDIX O

SUMMARY OF WORK DONE UNDER THE LIVE STOCK EXPERT TO
GOVERNMENT FOR THE YEAR 1928-29

Charge.—Mr. E. J. Bruen was in charge of this Section till the 13th April 1929, when he proceeded on 8 months' leave; Mr. Ali Mahomed Ulvi, B.Ag., acted for him.

During the year under report the Poultry Section of the Agricultural College Dairy was handed over to the Live Stock Expert with a view to its further expansion, development and utility to poultry keepers in general and to the cultivators in particular.

The work of the Live Stock Expert covers the following :—

- I. Advisory work.
- II. Propaganda and teaching in villages.
- III. Cattle improvement and issue of bulls on Premium System.
- IV. Demonstrations and Shows.
- V. Sheep and Goat improvement.
- VI. Improvement of the milch buffalo.
- VII. Poultry improvement.

Advisory and Propaganda Work.—There was a large number of inquiries for advice in connection with management and feeding of cattle, poultry and on the technique of Dairying. The usual work of visiting and advising Gowrakshans, Cattle and Poultry Breeding Farms was continued as in the past.

Demonstrations on silage-making have become popular and people are realising its value at a time when green stuff is scarce.

During the year under report the Divisional Inspector of Cattle Breeding, C. D., Pandharpur, delivered lectures by means of Magic Lantern with the aid of the Gogras Gowjivan Mandal, Bombay, in several villages of Pandharpur and Sangola talukas.

Cattle Breeding.—Cattle Breeding and Cattle Improvement Work so far was scattered throughout the Presidency, and was practically managed by the Live Stock Expert with the assistance of 3 Divisional Inspectors. In order therefore to concentrate the work and energies of the staff, the recommendations made by the Cattle Breeding Committee in their Report of 1923, and approved of by the Royal Commission were brought into effect during the year under Report, and with this end in view the activities of this Section have been confined to the pure breed cattle breeding zones of the Presidency. The work of improving other parts of the Presidency is to be carried on by the territorial Deputy Directors of Agriculture with the advice of the Live Stock Expert.

The sources for production of pure-bred stock consist of—

- (a) Cattle Breeding Farms.
- (b) Pure-breed Cattle Breeding Zones.

"A" Class bulls bred in (a) are put in approved villages of (b), where their offspring is specially watched, and suitable males—"B" Class bulls are issued to selected breeders for improvement of the cattle in the rest of the country side.

In this way provision has been made for the Sindhi, the Kankrej, the Tapti Khillari, the Gir and the Amrit Mahal (Halikar) breeds. No farms or institutes are yet provided for the Dangi, the Krishna Valley, and the Mhaswad Khillari (Central Deccan).

Premium Bulls.—The demand for Premium bulls far exceeds either the out-put from the cattle breeding farms or purchased bulls from grants allotted for the purpose. There is a big number of applications from all parts of the Presidency, which could not be met with for want of funds.

The number of bulls put out during the year under Report was 38 (*vide* Appendix A).

Demonstrations and Shows.—During the year Cattle Shows organised by the local bodies were held by this Section at the marginally noted places.

1. Athni (District Belgaum.)
2. Mahud Budruk (District Sholapur.)
3. Bombay (By the Bombay Gowrakshak Mandali.)
4. Bijapur.

In addition to these Shows grants-in-aid were provided to Cattle Shows held at Jalgaon, Mhasa (District Thana), Jacobabad, Kanmadi and Sangam (District Bijapur).

These Shows have become very popular and a sense of friendly rivalry and competition has taken hold of the people.

Silage demonstrations were conducted at the following places :—

1. Nipani, District Belgaum.
2. Turkewadi, do.
3. Tallur, do.
4. Killar, District Kanara.
5. Wai, District Satara.
6. Satara, do.
7. Talegaon Dabhade, District Poona.
8. Nedhrad, District Ahmedabad.
9. Dakor, District Kaira.
10. Allewadi, District Thana.

Sheep Breeding.—During the year under report 12 grade Merino Rams bred on the Hissar Farm (Punjab) were placed at Athni, Bijapur, Gadag, Tegur and Tallur. Results so far obtained on Rao Saheb S. S. Mangsoli's Farm (Athni) are encouraging. There have been some casualties and the causes are under investigation. The progeny born to these rams are a decided improvement on their dams, the fleece being finer, longer and in larger quantity per head, but the results have yet to be watched very carefully.

The solution of the important problem of Sheep Improvement in the Deccan depends upon establishment of a Sheep Breeding Farm for production of pedigree rams to be put out in villages.

Central Poultry Station, Kirkee.—During the year under report the Poultry Farm under the Agricultural College Dairy was transferred to this Section.

As there was little scope for expansion of the farm at the Dairy, arrangements have been made to remove the farm to plot No. 6, Bombay Road, where constructions on up-to-date lines consisting of one Unit Pen with 3 houses and 12 runs are nearing completion. One spacious Incubator House is also built to accommodate a large flock of chicks to be reared.

Mr. Zaidi, a non-graduate assistant, who is experienced in poultry breeding, worked as Manager throughout the year.

Strength of the Flocks.—The total strength on 30th June 1929 stood as below :—

Adult birds :—

Cocks	..	..	..	..	5
Hens	..	..	..	..	23

Young chicks and yearlings :—

Cockerels	..	..	..	..	44
Pullets	..	..	..	..	86

Total .. 158

Breeding Work and Performance.—This is the third year with our experience with White Leghorns and Black Australorps. We are now working with the third generation of the foundation stock started in 1926-27. The performance record of the third generation as compared with the previous ones is progressive as shown in the statement below :—

Breed.	Foundation Stock.			Poona Progeny.					
				Generation.					
				1st			2nd		3rd
				1926-27	1927-28	1928-29	1927-28	1928-29	1928-29
White Leghorns ..	112	103	85	167	146	100.1	177	103	232
Australorps ..	112	93	..	150	149	72.1	165	126	184

The individuals of the third generation show distinct superiority over their dams and grand dams.

During the year under report three new strains consisting of "Canadian", "Deward" and "Prince of Wales' Farm" were added to the existing strength of the flocks. A large number of breeding eggs and birds was distributed to poultry breeders and cultivators throughout the Presidency, and the demand is very keen.

The total sale-proceeds of the farm amounted to Rs. 1,044-15-0.

Northcote Cattle Farm, Chharodi

Charge.—The farm was in charge of Mr. M. M. Desai till 13th April 1929, after which Mr. D. S. Patel acted for him.

Season.—The season commenced a little late by the first week of July but the rainfall was well distributed right up to the end of September 1928. Hence water stagnation on the farm was at its minimum with the result that there was less of mosquito scourge, and cattle and workers kept good health. The shower of late rains in November helped the grass to keep fresh, providing green grazing till February 1929. The total rainfall recorded was 38·29 inches, being 2·29 inches above the average. The winter was unusually cold, the temperature having gone down to freezing point on 30th January 1929.

*Hay-making.**—The hay-making operations started on 3rd November 1928 and finished on 9th January 1929. The total yield of hay was 1,022,151 lbs., the cost for harvesting and stacking being Rs. 1-8-10 per 1,000 lbs. as against 1,250,302 lbs. at the rate of Rs. 2-2-1 per 1,000 lbs. in the year previous.

Ensilage.—Seven silo-pits—4 kacha and 3 pucca—were filled in with 510,863 lbs. of green stuff as shown below :—

				Lbs.
Green grass	..	..	..	236,550
„ Jowar	..	..	..	116,846
„ Maize	..	..	..	157,467
Total				510,863

Maize silage proved beneficial to milch stock in hot weather.

Breeding Herd.—The strength of the herd as it stood on the 30th June 1929 is as under :—

Stud bulls	..	..	..	8
Young bulls	..	..	..	26
Bull-calves	..	..	..	41
Cows	..	..	..	99
Heifers	..	..	..	43
Cow-calves	..	..	..	62
Bullocks	..	..	..	57
Buffalo-bullock	..	..	..	1
Total				337

The policy laid down the previous year was continued.

During the year 115,344 lbs. of milk was produced as against 116,763 lbs. in the previous year.

Appendix B shows the respective yields of milk and the distinct improvement gained during the period of 8 years. Out of the total number

of 100 cows milked, about one-sixth of the lot yielded about 3,000 lbs. in one lactation and a few went above 4,000 lbs.; one "Ravati" reaching the figure of 5,866 lbs. in 414 days, while "Meghan" yielded 4,889 lbs. in 336 days.

Regularity in calving and early maturity are the problems, which are given particular attention. Thirty-five heifers dropped their calves at an average age of 4 years and $4\frac{1}{2}$ months as against 24 heifers in the previous year. One heifer dropped her calf at the age of 3 years and 3 months.

Health of the Herd.—The animals maintained good health throughout the year. Eighty-nine births were recorded during the year as against 95 in the previous year; the total deaths being 11 as against 21 in the last year—out of these 9 were in young calves and only 2 in adults.

There was no other outbreak of contagious diseases except "Foot and Mouth", which lasted for a month without any casualties.

Sales.—During the year 131 animals were cast and sold at a total of Rs. 5,368. Most of the animals were sold by auction to outside cattle breeders and cultivators.

Bulls.—During the year 19 bulls were put out on Premium System as against 13 in the year previous. The distribution was as under:—

Ahmedabad District	..	..	14
Kaira	..	..	1
Surat	..	..	4
Total			19

Fodder Crops.—Deshi Jowar was sown over an area of 46 acres, Bajri over $2\frac{1}{2}$ acres, and an area of 8 acres 8 gunthas was put under Maize for silage. The crops made good growth and yielded satisfactorily. A mixture of Oats and Peas sown on 2 acres under irrigation to provide succulent feed in winter season yielded at the rate of 21,154 lbs. per acre.

Elephant Grass.—Elephant Grass was continued as a permanent crop on $\frac{1}{2}$ acre and yielded 50,189 lbs. per acre.

General.—The farm has served the purpose of supplying pedigree bulls to the public for improvement of the Kankrej breed of Gujerat.

During the Presidency Show at Ahmedabad, the staff of this farm were put to a very severe test in connection with organisation of the Live Stock Section of the Show.

Cattle Breeding Farm, Bankapur

Staff.—Mr. A. B. Gadagkar was in charge of the farm up to the 8th April 1929, when he proceeded on leave, and Mr. S. K. Angadi acted for him in addition to his duties as Divisional Inspector of Cattle Breeding, S. D.

Season.—The season during the year under report was favourable for growth of crops and late rains were well distributed. Yield of fodder crops was satisfactory.

Silage and Hay-making.—The farm area is limited and due to extension of area under cultivation every year, little is left for hay-making. Grazing is availed of in places where cultivation is impracticable. The total green grass cut for silage was 148,589 lbs. as against 157,785 lbs. the year previous. The total quantity of hay amounted to 107,020 lbs. as against 139,646 lbs. in the preceding year. More than half the grass area at the Kalasgeri lands was left uncut for want of funds. Also it could not be grazed up during the year under report for want of shelter to cattle and attendants. Housing accommodation on this farm is therefore very urgently needed.

Breeding Herd.—The strength of the cattle on the farm consists of 147 animals of the following description :—

Stud bulls	..	...	..	6
Young bulls	..	..	..	32
Bull-calves	..	..	..	15
Cows	..	..	..	42
Heifers	..	..	..	29
Cow-calves	..	..	..	14
Working cattle	..	..	..	9
Total ..				147

During the year under report the number of births recorded is 30, of which 18 were bull-calves and 12 cow-calves. The addition of pure bred bull purchased from Mysore Territory has been made to the breeding herd.

The Amrit Mahal breed is a purely draught breed, and its improvement besides constitutional vigour consists in :—

- (i) Early maturity.
- (ii) Regular calving.

The maturity age of heifers for service during the year under report average to 3 years, the earliest age being 2 years and 9 months.

Sales.—Some 53 animals of all description were sold. The net realization from 42 was Rs. 2,096 ; the remaining were issued on book transfer and Premium Bull System.

Premium Bulls.—During the year under report 7 bulls were put out on Premium System. The people have now realized the superiority of the farm bred bulls, the number of services by farm bulls to outside cows being 76.

Milking Experiments.—Some 5 farm bred cows were under milking test for a few months, the highest record being 1,431 lbs. in 198 days.

Health of the Animals.—The health of the stock was satisfactory throughout the year. There was out-break of "Black-Quarter" and "Foot and Mouth" disease with only 1 death in the former. Non-contagious diseases were responsible for 5 deaths in the herd.

Fodder Crops.—The total area brought under cultivation is 22 acres 30 gunthas as against 9 acres 21 gunthas in the year previous, and was cropped with :—

- Jowari fodder (local) on 11 acres. Nagli or Ragi on 2-20 acres.
- Maize on 8 acres. Lucerne on 0-20 acre.

Appendix C shows the yields.

Co-operation of the Bombay Gowrakshak Mandali at Kandivalee

Kandivalee Gowshala.—The work on Gir cattle at this Institute was conducted on the previous year's lines.

The strength of the herd as stood on 31st March 1929 consisted of :—

Bulls	..	..	..	2
Cows	..	..	..	51
Bull-calves	..	..	..	49
Cow-calves	..	..	..	54
Total				156

A number of pedigree bulls were issued to like institutions and cultivators for improvement of Gir cattle kept for milk in the locality.

Milk production.—During the year under report the total milk production amounted to 47,169 lbs. 12 ozs. The average figures for the year work out at :—

			Lbs.
Monthly average	..	..	5,241
Daily average	..	..	174·7
Daily milking average	..	..	7·5

Breeding Policy.—Considerable improvement has been effected in the production of more milk under proper care and management. Also good results have been obtained with regard to early maturity and regular calving, not losing the sight of strong constitution—so essential for the draught powers of the bullock. This section has now finished 5 years on working over this breed at this Institute. A new agreement for the next 5 years has been drawn.

General.—The authorities Mr. Motilal Kanji Kapadia, B.A., LL.B., J.P. and Rao Saheb Harjivan Valji, J.P., together with their Secretary—Mr. Nanalal T. Tarkas and Manager, Mr. T. P. Shah deserve credit for the efficient management of the Institution.

Nathoo Lalji Charity Trust Fund

Mulund Gowshala.—Here this Section worked on the same lines as at Kandivalee for the last 5 years with satisfactory results ; but as it is considered desirable to concentrate the work on the same breed at Kandivalee only, the subsidy to Mulund Gowshala has been discontinued.

ALI MUHAMMAD ULVI,

Acting Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX A

Statement showing the Premium bulls and breeding bulls put out during the year 1928-29

Name of breed.	Number distributed.	Remarks.
Kankrej ..	19	
Gir ..	1	
Dangi ..	1	
Amrit Mahal ..	10	
Mhaswad Khillar ..	1	
Krishna Valley ..	2	
Sindhi ..	3	
Surti • ..	1	Buffalo-bull.
Total ..	38	

ALI MUHAMMAD ULVI,
Acting Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX B

Statement showing the marked progress in yielding capacity of Kankrej herd at Chharodi within the period of 8 years

Serial No.	Year	Average number of cows during the year.	Number of animals milked.	Percentage of animals milked over the total number of cows during the year.	Number of animals yielding 1,500 lbs. and over during the year.	Percentage of animals of 1,500 lbs. and over to the total number of cows.	Annual average yield per animal milked.	Remarks.
				Per cent.		Per cent.	Lbs. ozs.	
1	1921-22	231	100	43	6	2.6	438 11	Milking operations were begun in December 1920.
2	1922-23	158	60	44	4	2.6	637 11	
3	1923-24	194	67	35	13	6.7	827 7	
4	1924-25	204	100	52	16	7.8	932 11	
5	1925-26	178	93	54	32	18.5	1,230 14	7 Cows in milk sold.
6	1926-27	181	100	60	28	15.4	1,074 1	2 Good cows suffered from disease during the year that greatly affected their yield.
7	1927-28	123	90	70	33	25.6	1,400 0	
8	1928-29	100	94*	94	31	31.0	1,456 0	

*Note.—Cows yielding below a total of 100 lbs. in a lactation period are not included in this number.

ALI MUHAMMAD ULVI,
Acting Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX C

Statement showing yield of green fodder crops on the Bankapur Farm

Name of crop.	Area.	Total yield.	Fed green.	Turned into silage.
	A. g.	lbs.	Lbs.	Lbs.
Jowar fodder ..	11 0	344,056	133,860	205,256
Maize ..	8 0	56,298	1,500	54,798
Nagli (Ragi) fodder ..	2 20	32,760	9,060	23,760
Lucerne ..	0 20	6,350	6,350	....

ALI MUHAMMAD ULVI,
Acting Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX P

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL ENGINEER TO GOVERNMENT, BOMBAY, POONA, FOR THE YEAR 1928-29.

I held charge of the Post of the Agricultural Engineer to Government during the year 1928-29.

Special activities of the Department in addition to the routine legitimate duties, were directed to four sections, *viz.*, Research on Implements, Presidency Agricultural Show at Ahmedabad, Boring and Pumping ; of which the Boring and the Show absorbed considerable time and energy. As pointed out in my report of 1926-27 I contend that the Agricultural Shows cannot be attended to properly without dislocation of other activities and if the Shows are to be held annually or every alternate year it is essential to have an independent Officer with necessary staff and material exclusively for the work in order to maintain the continuity and proper standard of work in the Department.

The question of organisation of Boring is not yet decided and this has generally affected the progress of work in that line and if early steps in that connection are not taken there is every possibility of unsatisfactory work in the future. It is not wise to continue this state of uncertainty one year after another and if the future of Boring is not yet definitely in view, it is better to organise the work with the staff and material available, assuming that it is going to remain in the Agricultural Department indefinitely. The activities in this connection have been considerably increased during the last 2-3 years resulting in increasing the number of machines from 29 to 87 and it is very difficult to run this important Section of work without proper organisation and without knowing the definite future.

Advisory

There were 138 Technical enquiries received in the year under reports of which 42 were for pumping, 56 for Boring, 11 for Motor Plough, 6 for Cane Crusher, 3 for the New Seed Drill and 20 for miscellaneous subjects. There were 78 applications from cultivator students for training in the oil engine class, of which only 30 were admitted in the class, and trained. The enquiries in this connection have increased to such an extent that we cannot possibly cope with the demand, with the facilities at our command, and although the classes are held at every quarter we cannot train more than 25 to 30 students in the year in the absence of a proper Instructor and suitable accommodation for the class. Inquiries in the Pumping seem to have some what increased as compared with last year but very few feasible schemes matured even when detailed estimates were called for. The number of river surveys for famine pumping has dropped to 5 on account of the work in connection with the Presidency Show. Moreover the periodical inspection of machinery in the divisions suffered a good deal on this account.

The drawing office has turned out 47 sketches and 39 drawings on various problems and schemes we are coping with, including 9 detailed

surveys on pumping and a new design for a Cow Byre to accommodate 34 animals.

This year I had an opportunity to go to Sind to inspect the machinery at the several Farms and also arrange for the construction of a second Tube Well at Sakrand. The final decision is pending the results of the two trial bores that are at present under operation. If they give good signs of the requisite supply of water, the matter will be taken up at once. As regards my inspection of Machinery at the several Farms I am submitting my report to the Director of Agriculture. Judging from what I saw and having considerable experience of Sind condition, I think it very essential to have a full time Engineer in the Province. I must, however, commend Mr. Tambe, who has endeavoured to carry on the work under the circumstances and who I think has given satisfaction.

Experimental and Research

Seed Drill.—Exhaustive experiments with the New Seed Drill revealed the fact that it required further modification with a view to bring about more satisfactory results. These are being effected. Previously we had to keep several driving and driven pulleys with the Implement to suit the seed rate required at several places. This has been dispensed with by the introduction of suitable cone pulleys which give a wide range. The split beam is a second feature in the drill which gives a wider range in the spacing of the coulters and its latest clamping arrangement and the change in the design and position of the axle bearing brackets, add much to its utility. The Seed Box has been lowered on to the beam in order to prevent irregular dropping of the seed due to the longer tubes. The question of draft is an important factor which can only be solved by mass production. The draft on this drill amounts to 180 lbs. against 120 lbs. on the indigenous Drill and the weight 260 lbs. against 110 lbs. of the local drill. I am designing a new model embodying all the features of the improved drill but with a change in the material with a view to lighten the weight and consequently the draft. There is a proposal before me to lift the implement at the end of the field to facilitate turning which I am dealing with on the new design.

Winnower.—Experiments with the Winnower resulted in modifications in the machine and building up of an entirely new model embodying all the features of the old one with the necessary improvements. The machine can successfully deal with Jowar now, and experiments with wheat with a new type of rotary sieve are in progress. The draft can be ranged from 7 to 12 miles velocity per hour and the finished model is capable of dealing with 1,000 lbs. of threshed stuff at the cost of Re. 0-5-0.

This year we have been fortunate in getting a New Howard's Rotary Potato Digger for experimental purposes and I hope to give detailed information regarding its performance in a subsequent report on testing the machine during the next harvest for ground-nut and potatoes.

I have also a new model of the Monotrac machine from the Makers for experimental purposes. It is claimed to be useful for interculture only

and I shall be able to give some figures regarding its working next year. The design is certainly most ingenious as it consists of one hollow wheel only in which the prime mover is situated. The steering is to be done by the Operator who has to walk behind it.

The machine, however, looks more like a toy and costs over Rs. 1,000.

At the request of Dr. Burns, the Principal, Agricultural College, Poona, I have designed a bullock power implement to extract spears out of the spear grass. It consists of several wire combs arranged on a frame in parallel which take out the spears when the implement is drawn and is very effective. The cost is estimated at Rs. 50 each approximately.

Executive Work

Boring.—This year the inquiries for Boring have fallen considerably, partly on account of good rains last year, and partly on account of the want of necessary publicity and canvassing. Although the utility of Boring has been greatly appreciated by the Agriculturists still it does want better organisation and canvassing to secure sufficient work for all the machines in the Presidency, especially those which are meant for Famine work. At present the work is conducted under several Agencies which naturally complicates matters and causes delay. Centralisation of machines has become almost impossible and supervision is difficult over large scattered areas. Unless the system of work is revised and made simpler and easier for the Agriculturist to secure a machine, inquiries will not increase.

The total number of famine machines which were at work amounted to 24, of which 9 were of power and 15 of hand. They made 71 bores with a total depth of 3,267 feet tapping 15,106 gallons of water per hour, and realising Rs. 2,174-8-0 as Boring receipts. A schedule is attached herewith giving their location and other particulars.

Show at Ahmedabad.—The Presidency Show at Ahmedabad absorbed a good deal of time and energy and occupied 27 men fully for over two months in executing the following works :—

(1) Erection and running of 16 B. H. P. Tangye engine and 3" Tangye Pump (Centrifugal) with pipes and connections and a countershaft between, on a well in the Show Ground.

(2) Erection and running of an Air Lift on a well, consisting of a vertical Air Compressor, a 6 B. H. P. McCormick engine and air and water connections.

(3) Erection and running of a bore-hole type deep well power pump on a well with a 3 B. H. P. Blackstone engine.

(4) Erection and running of an Aquatole chain water lift on a well with 5 B. H. P. Petter Junior Engine.

(5) Erection of a small combined set on a surface tank consisting of a 3 B. H. P. engine and 2½" centrifugal pump, etc.

(6) Erection and working of 3 Boring Machines, viz :—(1) The F-3 Calyx Drill, (2) The Musto Power Machine and (3) The Modified Cawnpore Hand Machine.

(7) Supplying water to all the Exhibitors at the Machinery Court in addition to the working of the above machines and demonstration of the Improved Seed Drill and Winnowers.

(8) Dismantling the above machines after the Show and bringing them to Poona.

Nangaon Plant.—The Pumping Plant at Nangaon, District Poona, worked for 150 days in the year, irrigating 22 acres under perennial, 54 under seasonal and 20 under miscellaneous crops and realised Rs. 3,602. Although there was no stoppage of any kind in the working season the demand for water greatly failed on account of the Ryot's pecuniary circumstances; resulting in further loss to Government and the consequent decision of Government to close down the Plant entirely. It is really a pity to close down such a valuable and useful pumping plant erected on a large river in the Presidency, especially on account of the Cultivators' poverty and it is worth while a Co-operative Banking Society to come forward to assist and take the benefit of the plant rather than allowing it to rust or realising, if sold, an inadequate amount.

Pumping

Plants on Hire.—The following pumping plants have been erected and hired out to Agriculturists in addition to the two already hired out last year. The total comes to 7 in all.

(1) 7 B. H. P. Kerosine engine and 3" centrifugal pump with pipes and connections to Mr. Shitole of Patas.

(2) 3 B. H. P. engine and 2½" centrifugal pump with connections to Mr. G. G. Thakar of Poona City.

(3) 3 B. H. P. engine and 2½" centrifugal pump to the Lloyd Polo Club, Poona.

(4) 7 B. H. P. engine and 3" centrifugal pump with connections to Mr. V. A. Gokhale of Poona at Loni.

(5) 7 B. H. P. engine and 3" centrifugal pump to Mr. N. M. Kalbhor of Loni.

The total hire charges actually recovered from this and last year's balance amount to Rs. 799-8-11.

Service Rendered.—This year I had to keep a first grade fitter in Gujraht Division to attend to the duties of the Mechanical Assistant on account of the permanent incumbent being called to act as Boring Overseer during a leave vacancy. The principal works executed by him are enumerated as under :—

(1) Erection of a pumping plant on a well at Watva near Ahmedabad, comprising of a Blackstone Crude Oil Engine and pump with connections.

(2) Erection of the Machinery at the Agricultural School, Godhra.

(3) Repairs to the Bore-hole Pump at Anand.

In addition to the above I had to send men to repair the Portable engines and pumps at Sakrand in Sind and also undertake the building of a Poultry Farm at Poona.

Workshops and Experimental Well.—This year I had the opportunity of getting some funds from the Sir Sassoon David Trust Fund to purchase an Air Lift Plant with a suitable prime mover for use on the Experimental Well. Both the engines (7 B. H. P. Crossley Crude) and the Compressor (Ingersoll Rand Horizontal Type) have been fitted and the work of erecting the Air Lift on a 5" bore-hole 200' deep in the compound is in progress and I hope to be able to give some useful figures regarding their performance next year.

General.—The total receipts of the Department, including pumping, boring and service rendered to the public amounts to Rs. 17,405-4-9.

This year I had the opportunity of inspecting two tractors, one in Dharwar District and the other in Bijapur District, worked by the Anti-famine Institute, and the Dharwar Association. The visits were paid to give necessary advice regarding their efficient running. Obviously the greatest drawback which retarded the progress in this line of work was the absence of good efficient and conscientious drivers without which it is impossible to show such schemes a success. We are negotiating with Tractor Firms in Bombay to assist us in training men for the Public and hope to say something definite in the matter next year.

This year we have introduced the Bin Cards system at the Stores in addition to the other forms we are already using. These facilitate checking of any article at a moment's notice and giving us at a glance what we possess in the Stores and what has been spent to-date.

Negotiations for the sale of the Steam Plough, Baling Plant and Nangaoon Pumping Plant are in operation.

This year two or three principle members of my staff went on leave. First my Assistant Mr. Paranjpe was on 4 months' leave from end of December 1928 and Mr. V. Y. Chitale my first Boring Overseer acted for him. Then Mr. V. Y. Chitale went on 4 months' leave immediately on Mr. Paranjpe's return on 28th of April 1929 and his Post is being occupied by Mr. Vaidya, Mechanical Assistant, Gujrat, from January 1929. My second Boring Overseer, Mr. Modak had also to go on 4 months' leave due to illness, and Mr. S. D. Chitale, my Shop Superintendent acted for him until 22nd June 1929.

Notwithstanding my staff has done exceedingly well.

Finally I should like to record my great appreciation of the good work done by my staff.

Owing to the increased activities in my Department it is a matter of hammer-and-tongs, both for myself and my staff and I am pleased with the way, all my important men have risen to the occasion.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

**STATEMENT OF BORING WORK DONE
DURING 1928-29**

Statement of Boring Work

Serial No.	Name of Owner	Survey No.	Village	Taluka
1	2	3	4	5
<i>Poona District.</i>				
1	Mr. Haji Musa ..	86	Wanowli ..	Haveli ..
2	Lt.-Col. Tugwell ..	..	Dhanori ..	Do. ..
3	Executive Engineer, Minor Irrigation Works. ..	..	Kapare ..	Do. ..
4	Do. ..	..	Do. ..	Do. ..
5	Do. ..	..	Do. ..	Do. ..
6	Do. ..	..	Do. ..	Do. ..
7	Superintendent, Agricultural Farm. ..	..	Manjri ..	Do. ..
8	Dr. N. R. Bhide ..	In City ..	Poona ..	Do. ..
9	Dr. G. W. Dudley ..	113	Chinchwad ..	Do. ..
10	Do. ..	143	Do. ..	Do. ..
<i>Satara District.</i>				
11	Executive Engineer, Public Works Department. ..	Government House Compound.	Mahableshwar ..	Javali ..
<i>Nasik District.</i>				
12	Mr. R. P. Kulkarni ..	..	Naydongri ..	Nandgaon ..
<i>West Khandesh District.</i>				
13	Mr. Sambhubhai Desai ..	..	Nandurbar ..	Nandurbar ..
<i>Panch Mahals District.</i>				
14	Political Agent, Rewa Kantha Agency. ..	144/141	Madhwas ..	Rewa Kantha Agency. ..
<i>Ahmednagar District.</i>				
15	Garrison Engineer ..	Military Water Supply Station.	Ahmednagar ..	Ahmednagar ..
16	President, Taluka Local Board. ..	78	Adhavwadi ..	Do. ..
<i>Sholapur District.</i>				
17	Mr. Pandurang Govind Dhus ..	140	Pimpalgaon ..	Basal ..
<i>Ichalkaranji State.</i>				
18	State ..	Village ..	Shirdon ..	Ichalkaranji ..
<i>Bijapur District.</i>				
19	Taluka Local Board, Badami ..	..	Kainkatti ..	Badami ..
20	Do. ..	23	Sipermatti ..	Do. ..
21	Do. ..	..	Kainkatti ..	Do. ..
22	Do. ..	..	Yendigeri ..	Do. ..
23	Do. ..	..	Kallapur ..	Do. ..
24	Do. ..	..	Mudkavi ..	Do. ..
25	Taluka Local Board, Bijapur ..	Gaothan ..	Bableshwar ..	Bijapur ..
26	Do. ..	Do. ..	Bablad ..	Do. ..

done during 1928-29

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
6	7	8	9	10
3"	50' 0"	Nil.	Nil.	Unsuccessful.
3"	7' 0"	Nil.	....	In progress.
6"	20' 4"	....	....	For taking trial bores for foundation of a new dam.
6"	20' 8"	....	....	
6"	16' 10"	....	....	
6"	10' 5"	....	....	
6"	94' 0"	Nil.	1,000	Successful.
6"	125' 0"	Nil.	200	Do.
6"	100' 0"	Nil.	....	Rejected.
6"	23' 0"	Nil.	200	Successful.
6"	40' 0"	Nil.	....	In progress.
6"	100' 0"	Nil.	....	In progress.
6"	72' 0"	Nil.	....	In progress.
6"	100' 0"	Nil.	200	Successful.
6"	20' 0"	Not known	....	Left as per owner's request.
6"	154' 0"	Nil.	....	In progress.
3"	20' 0"	500	....	In progress.
6"	61' 0"	Nil.	200	Successful. Last year's work 47'. Total bore completed 108'.
3"	16' 0"	Nil.	....	Unsuccessful.
3"	56' 9"	Nil.	....	Do.
3"	34' 6"	Nil.	260	Successful.
3"	23' 4"	Nil.	260	Do.
3"	55' 2"	Nil.	....	Unsuccessful.
3"	27' 4"	Nil.	....	In progress.
3"	50' 0"	Nil.	....	Unsuccessful.
3"	49' 0"	Nil.	260	Successful.

Serial No.	Name of Owner	Survey No.	Village	Taluka
1	2	3	4	5
	<i>Bijapur District—contd.</i>			
27	Taluka Local Board, Bijapur ..	Gaothan ..	Bablad ..	Bijapur ..
28	Taluka Local Board, Sindgi ..	Do. ..	Mannapur ..	Sindgi ..
29	Do. ..	Do. ..	Harval ..	Do. ..
30	Do. ..	Do. ..	Chattarki ..	Do. ..
31	Do. ..	Do. ..	Sindgi ..	Do. ..
32	Mr. Lalchand Shrimai ..	In village ..	Gulodgudd ..	Bagalkot ..
33	„ Pannalal Jamnadas ..	Do. ..	Do. ..	Do. ..
34	„ Narayan Krishna Hangal ..	Do. ..	Bagalkot ..	Do. ..
35	„ Shrinivasrao Desai ..	41 ..	Gaddankeri ..	Do. ..
36	Do. ..	41 ..	Do. ..	Do. ..
37	Do. ..	39 ..	Do. ..	Do. ..
38	Taluka Local Board, Sindgi ..	.. ..	Tarkangeri ..	Sindgi ..
39	Mr. Bassaya Math ..	368 ..	Yenkauchi ..	Do. ..
40	Taluka Local Board, Sindgi ..	Gaothan ..	Mannapur ..	Do. ..
41	Do. ..	Do. ..	Chikaindgi ..	Do. ..
42	Mr. Basappa Ningappa ..	255 ..	Koralli ..	Do. ..
43	„ Niglingappa Malkappa ..	245 ..	Do. ..	Do. ..
44	Harve Sabhapati & Co. ..	40 ..	Telgi ..	Bagewadi ..
45	Anti-Famine Institute ..	Compound ..	Bijapur ..	Bijapur ..
46	Mr. Balkisandas Venkatdas ..	44 ..	Bagalkot ..	Bagalkot ..
47	Do. ..	44 ..	Do. ..	Do. ..
48	Mr. Savanur ..	Cotton Market ..	Do. ..	Do. ..
	<i>Dharwar District.</i>			
49	Mr. Karvirappa, Vakil ..	.. ..	Naiknur ..	Navalgund ..
50	„ Swamirao Deshpande ..	Gaothan ..	Aladkatti ..	Hangal ..
51	Do. ..	Do. ..	Do. ..	Do. ..
52	Mr. B. C. Advani Math ..	Do. ..	Bankapur ..	Shiggaon ..
53	Sub-Divisional Officer, Haveri ..	Police lines ..	Hirekerur ..	Kod ..
54	Mr. Basappa Tirkappa ..	24 ..	Ranibennur ..	Ranibennur ..
55	„ Mallappa Shidlingappa ..	1 ..	Deogoudankatti ..	Do. ..
56	„ Kankappa Mariyappa ..	Village site ..	Do. ..	Do. ..
57	„ Subhapa Gundappa ..	Gaothan ..	Chalgeri ..	Do. ..
58	Do. ..	Do. ..	Do. ..	Do. ..
59	Mr. Barangauda Gangangauda ..	122 ..	Do. ..	Do. ..
60	„ Mudlingappa ..	Gaothan ..	Do. ..	Do. ..
61	Sarvajani Work ..	Do. ..	Marewad ..	Bharwad ..
62	Do. ..	Do. ..	Do. ..	Do. ..
63	Mr. Bindurao Deshpande ..	Village ..	Aminbhavi ..	Do. ..

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
6	7	8	9	10
3"	50' 0"	NH.	280	Successful.
3"	30' 0"	NH.	200	Do.
3"	75' 0"	NH.	260	Do.
3"	28' 6"	200	500	Do.
3"	3' 0"	100	575	Do.
3"	64' 0"	NH.	260	Do.
3"	40' 30"	NH.	....	In progress.
3"	92' 0"	NH.	200	Successful.
3"	15' 0"	600	350	Do.
3"	16' 0"	600	350	Do.
3"	15' 0"	NH.	250	Do.
3"	41' 0"	Not known	260	Do.
3"	30' 0"	....	....	Stopped as per owner's request.
3"	38' 0"	....	....	Do.
3"	51' 0"	NH.	200	Successful.
3"	48' 0"	NH.	800	Do.
3"	50' 0"	600	1,000	Do.
3"	48' 0"	NH.	280	Do.
3"	8' 0"	NH.	....	In progress.
6"	78' 0"	NH.	240	Successful.
6"	30' 0"	NH.	400	Do.
6"	95' 0"	NH.	240	Do.
3"	18' 0"	NH.	260	Successful.
3"	1' 6"	NH.	200	Do.
3"	4' 6"	NH.	200	Do.
3"	97' 11"	NH.	....	In progress.
3"	80' 0"	NH.	240	Successful.
3"	4' 6"	NH.	240	Do.
3"	50' 0"	NH.	1,000	Do.
3"	316' 0"	NH.	200	Do.
3"	55' 6"	NH.	200	Do.
3"	27' 0"	....	....	Stopped by owner.
3"	31' 0"	500	1,000	Successful.
3"	17' 9"	NH.	....	In progress.
3"	25' 0"	NH.	NH.	Unsuccessful.
3"	27' 0"	NH.	200	Successful.
3"	13' 0"	20	200	Do.

Serial No.	Name of Owner	Survey No.	Village	Taluka
1	2	3	4	5
	<i>Dharwar District—contd.</i>			
64	Public Work	Gaithan	Kardigudd	Dharwar
65	Sub-Divisional Officer, Haveri	P.W.D. Bungalow	Hirekerur	Kod
66	Do.	Gaithan	Rattihalli	Hirekerur (Kod)
67	Mr. Kariyappa Arabgouda	1	Kottenhalli	Haveri
68	„ Bhimbhat Joshi	199	Kanvali	Do.
69	„ V. P. Chawadi	331	Kotumachagi	Gadag
70	District Local Board, Dharwar	102	Kalasapur	Do.
71	President, Gadag Municipality	Grain Market	Gadag	Do.
				Total number of
				Total Footage
				Total number of gallons

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
6	7	8	9	10
3"	50' 0"	<i>NH.</i>	200	Successful.
3"	77' 0"	<i>NH.</i>	240	Do.
3"	40' 0"	200	....	In progress.
3"	48' 0"	300	....	Stopped by owner
3"	31' 6"	250	....	In progress.
6"	85' 0"	<i>NH.</i>	240	Successful.
6"	35' 0"	<i>NH.</i>	<i>NH.</i>	Unsuccessful.
6"	40' 0"	<i>NH.</i>	....	In progress.
Bores made—74.				
bored—3,267' 0"				
tapped—16,106 per hour.				

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

APPENDIX Q

SUMMARY OF WORK DONE UNDER THE HORTICULTURIST TO GOVERNMENT, BOMBAY PRESIDENCY, POONA, FOR THE YEAR 1928-29

Staff.—Dr. Cheema held charge of the office of the Horticulturist to Government from the beginning of the year up to May 9, 1929, when he went on leave for three months; and Mr. H. P. Paranjpye, District Horticultural Officer, is acting in his place from that date. Mr. P. G. Dani is acting in place of Mr. H. P. Paranjpye, and his place is taken by Mr. V. H. Kulkarni as Superintendent, Modibag. Mr. G. B. Deshmukh, Graduate Assistant, is placed in charge of a small nursery recently started at Alibag from April 1929.

Financial Condition.—The financial condition of this section shows no improvement and on the contrary further reduction in grants at disposal of the Horticulturist causes considerable contraction in the activities of the whole staff. A well equipped laboratory, timely sanction of adequate Travelling grants and a little more liberal budget for the Ganeshkhind and Modibag gardens will enable the staff to discharge their duties to their fullest capacity.

Publications.—The following publications were issued during the year under report :—

Bulletin No. 158 of 1929—"Preliminary Note on the Possibilities of the Development of the Lemon Industry in Western India" by Dr. G. S. Cheema and Mr. P. G. Dani,

"Hints on Fig Cultivation"—Leaflet No. 4 of 1929 revised.

Teaching Work.—It has been several times mentioned in the previous Annual Reports that the necessity of appointing a whole time Assistant Professor of Horticulture was keenly felt to carry on the teaching work satisfactorily. It is again requested that this appointment should be made as soon as possible as suggested in Government Order No. 12179 of 13th November 1919, Revenue Department, as the teaching work is getting heavier every year due to great rush of Short Course students as well as College students for Advanced Course in Horticulture.

Laboratory Work.—The experiments conducted as stated in last year's report, in connection with lime juice manufacture and its preservation, preparation of fruit jellies and preservation of *bor* are now completed; and the results will be shortly submitted for publication.

At this stage necessity of a well equipped laboratory is keenly felt for further research work on sound basis. A mention of this was made in the last year's report.

Ganeshkhind Botanical Gardens

The Season.—On the 31st January and 1st February 1929 occurred severe frost which completely damaged the leaves and fruits of papaya, banana and fig plants and also mango blossom to a great extent.

These crops and also mango fruits were further subjected to a heavy hail storm on the 6th of April 1929. Grapes however were not affected.

Figs.—The fig plants introduced from foreign countries are progressing satisfactorily. They produced this year their first crop which was unfortunately destroyed by frost and then by hail storm.

Guavas.—Guava grafts planted in January 1926 are making satisfactory progress ; they are grown with a view to see if they turn out true to the original type.

Bananas.—Some of the seedlings of banana—Sonkel Chanda variety—have continued to produce saffron coloured flesh in the third sucker generation too, probably indicating that it is a fixed character. One seedling of plant No. 8 shows pink-tinged petiole and this character is absent in other seedlings.

Seedlings of Nendrabali have produced fruits with little pulp and large number of seeds which, however, did not germinate.

Topworking of Mango Trees.—The seedling trees pruned in March 1928 for topworking in the Nigde Forest are making very slow growth ; and therefore the operation of topworking is delayed ; this will be taken in hand shortly and vigorous growing varieties like the Pairi will be used for this purpose with a few of slow growing Alphonso for comparison.

Grapes.—The Pandhari Sahebi which is naturally self sterile can be effectively pollinated with pollen either of Bhokari, Phakdi, Black Prince or of Neelum and the bunch ripens in about 90 days. These weigh a little over 2 lbs.

Cuttings of Pomegranate.—In Gujarat pomegranate is often propagated by cuttings and in the Deccan by seed. It is found that cuttings of pomegranate take root quickly and produce fruits in about two years.

Stocks for Citrus.—Among the different varieties of stocks for Citrus, Jamburi No. 112 maintains its position as the most vigorous stock in Shadu soil. The graft of Santra on Kawath stock (*Feronia Elephantum*) has borne this year a large number of fruits. The fruits of the first crop which ripened in April 1928 were dry and spongy, although their size was normal. The fruits ripened this year were juicy and nice ; and the bearing was profuse. After the harvesting of the fruits the tree showed symptoms of exhaustion but it improved on the application of manure. The plant is now affected by gummosis.

Attempts to graft Santra on Bel stock (*Ægle Marmelos*) have not been successful so far.

Behaviour of Orange Plants in Shadu Soil.—Pot-plants grown in Shadu soil with a view to find out the effect of physical and chemical nature of the soil have yielded the following results :—

(1) Plants with improved physical conditions of the soil by the addition of brick dust and charcoal powder have not proved better than the control.

(2) Plants treated with sulphate of ammonia and superphosphate have shown very good performance.

(3) Plants treated with sulphate of potash have been worse than the control plants.

(4) Plants treated with farm yard manure have improved in proportion to the dose of manure added.

Modibag Gardens

The Season.—The 1st of February 1929 witnessed a severe wave of cold and frost when the temperature went down to 34° F. affecting certain fruit and vegetable crops very badly. In the Modibag the banana crop was damaged to a certain extent. The *basrai* variety of banana suffered the most and the plants had to be removed. The Rajapuri variety of banana completely escaped damage by frost.

Figs.—The fig crop is very liable to fig rust (*Uredo fici*) which sometimes causes considerable damage to the fruit and leaves. This year the trees were treated with sulphur dusting and the result was very good; this treatment, however, requires further trials. White and Black varieties of fig imported from Baghdad eight years ago have not yet acclimatized here and do not produce satisfactory fruit.

Pomegranates.—From the experience of eight years it has been found that paper bagging of young fruits against the anar-caterpillar (*Virachola Isocrates*) is very effective and economic. Now the serious problem before the pomegranate grower is the wet rot disease of this crop and experiments are being devised to control this.

The present orchard of pomegranate trees is being divided into two sub-plots with a view to find out the comparative advantages of Ambabahar (February-flowering) and Mrigbahar (June-flowering) with special reference to (1) yield, (2) anar-caterpillar and (3) wet rot.

Grapes.—This crop was a total failure in the Nasik District, owing to frost but fortunately it was not affected by cold in the Modibag. The crop was a normal one.

Sulphur dusting against grape vine mildew has given excellent result; no trace of mildew was noticed on the vines. The berries develop their natural colour by sulphur dusting while Bordeaux mixture causes staining of the berries.

Out of the eight varieties of grape imported from Baghdad two of them, *viz.*, Des-el-ans and Ajami have proved successful and are very regular in bearing; these are late varieties; and are much in demand by grape growers.

Breeding and Selection of Grapes.—A large number of seedlings of Pandhari Sahebi have borne fruit and seedling No. 82 produced its first

small crop this year ; the berries are like those of Bhokri but smaller in size ; skin leathery ; juice not so sweet ; bunch loose. Out of the seedlings Nos. 16, 31, 32, 35 and 41 dry well.

Citrus.—The “Kharna” had given very promising results as a stock for citrus last year and this is being raised on a large scale to test its suitability as a stock plant on a plantation scale.

The fruits of Chinese orange borne on pomelo stock were of the normal size and showed no variation from the fruits grown on the Jamburi stock.

The Italian Lemon is attracting the notice of the public and attempt is, therefore, being made to propagate this plant for distribution to the public. Also a plot of navel oranges is being opened to test its comparative value against the popular Mosambi plants.

Banana.—As remarked above the Basrai variety of banana suffered heavily by frost and was removed ; but the Kali variety of Junnar which was then in young stage was not affected by frost and is progressing satisfactorily.

Papaya.—During the last five years papaya was grown as a subsidiary crop between mango trees which are planted at 30 feet apart. Papaya crop thrived well as usual and did not seem to affect the main crop of mango.

Mango.—The mango crop in the Modibag was not so good as it was outside. The grafted varieties that had borne fruit to some extent were Alphonso, Pairi, Shendrya, Kelya, and Cawasji Patel, planted in September 1921.

As a precautionary measure mango blossoms were dusted with sulphur and mango blight did not appear.

To test how far country varieties of mango come true to the parent type, six plants of each of different varieties were grown in 1924 and of these three have borne fruit this year. They do not differ from the parent type except in size which is smaller in the second generation.

Advisory and District Work

During the year under report my District Staff was engaged for a long time in managing and getting ready the Horticultural Court at the Presidency Agricultural Show, Ahmedabad. In this Court the improved methods of cultivating different fruit crops, as also ornamental plants which can be easily and successfully grown in Gujarat were shown to the public. Demonstration in the manufacture of lime juice and its preservation, preparation of fruit jellies and drying of vegetables, was highly appreciated by the public. Nursery Bazaar where considerable business was done by the public was a unique success in this Court.

During this year no less than 738 enquiries regarding fruit cultivation were received from the public. Besides this improvement of wild *bor* trees by budding and country mango trees by grafting, treatment of

orange trees affected by gummosis and die-back, and demonstration of the treatment of grape vine mildew by sulphur dusting taxed all the energies of the district staff and further work in this line is limited by inadequate funds.

Demonstrations in mango canning at Bijapur and at Ratnagiri were highly appreciated by the public.

My staff on the whole has worked satisfactorily.

H. P. PARANJPYE,
Ag. Horticulturist to Government,
Bombay Presidency, Poona.

APPENDIX R

SUMMARY OF WORK DONE UNDER THE INSPECTOR OF AGRICULTURAL SCHOOLS, BOMBAY PRESIDENCY, POONA, DURING THE YEAR 1928-29

The permanent incumbent Mr. K. M. Powar having been deputed to act as Deputy Director of Agriculture, N. C. D., Nasik, I held charge of the post during the year under report. The former Itinerant Weaving Assistant, having resigned the post, Mr. M. C. Vadal took up the charge from the latter part of May 1928.

Nature of work.—The nature of my work has been purely advisory. Some propaganda work was, however, taken at the request of the Director of Public Instruction in respect of the Agricultural Bias classes and select members of a few District School Boards were interviewed.

The Vernacular Agricultural Schools.—The number of these schools remained the same as in previous years. The system of giving scholarships of two different values was introduced during the year, at two of these schools, viz., Loni and Devi-Hosur. It remains to be yet seen how this will work out. The success of the system of offering low rate of scholarship depends very largely on the exertions of the Head-Master and the sincere co-operation of his staff. It is not that many boys now seeking admission are unable to meet their expenses, but it is human nature to try to get as much as possible when it is offered.

Curriculum.—Though the curriculum remained theoretically the same, much of the portion which was not of practical use to the boys in their business was dropped and that portion which had practical bearing was more emphasised. Attempts are also being made to change the cropping scheme of the school farms so as to run them on business lines as far as possible through these very boys, giving them some stimulus for extra work in the form of some cash remuneration. This will greatly economise the net expenditure on these farms.

Inspection and Examination.—The inspection as also the examination was conducted from the point of practical utility of the tuition to the boys in their home farming. It is gratifying to note that almost all the schools have fairly well responded to the suggestions offered and have shown good work. From the results of the Annual Examination, it is noticed that the Vernacular Assistants do not pay proper attention to the teaching of their subjects as required at our schools, though their method of teaching is very satisfactory. Owing to the frequent change in the personnel of staff at Jambul school, the work of the first year boys has not been so very satisfactory. Besides, there is the usual complaint of Malaria every year at that school. In the case of Godhra school, the agricultural subjects also need more attention.

Work of the Weaving Assistant.—Since the entertainment of the weaving assistant, weaving at the agricultural schools has been

systematically taken up and the boys have been doing very good work in this, especially so, at Surat and Devi-Hosur schools. The staff at the Dhulia agricultural school is now being trained and Loni school will be next taken up.

Work of past students.—In order to have up-to-date information regarding the work of the past students, it has been arranged to keep a regular record of the work of the past students. Many of the boys passed out have been doing good work, especially so, the boys from Devi-Hosur school. It is very gratifying to note that the Deputy Director of Agriculture, Southern Division, and the Head-Master of Devi-Hosur school have been trying to increase the efficiency of that school in all possible ways and attract a good many of these boys to the Social gathering of their school and get very interesting and educative reports from these boys which is a feature not generally noticed at other schools. Frequent supervision of these past students' work or to quote the words from the Government Resolution on the Quinquennial report of the Educational Department, the "After care of work" of these boys by either the staff of these schools or the Inspector of Agricultural Schools with some assistant is of the greatest importance and has been found to be so in the case of Reformatory schools. The establishment of Divisional organisations on the lines of After Care Societies proposed to be started by Government for Reformatory schools will aid the Agricultural Department in keeping close touch with these boys and have accurate record of the work done by these boys. One of this type has been formed in Southern Division but it badly stands in need of help from the Department officers in the working of the Institution by their presence as ex-officio Office bearers of the Institution. Unless the after care of these boys is taken, the real effect of these agricultural schools will not be appreciably noticed and the money spent on these will, as it were, be wasted.

The Agricultural Bias Classes.—There are 80 classes now at work in the whole of the Presidency of which 4 are under the different Missions. It is learnt with great satisfaction that as a result of practical demonstration of one of such classes at the two Presidency Agricultural Shows, many Native States and some Mission authorities have opened such classes. These classes have been at work in this Presidency since these six years. Experience so far gained shows that villages even with some urban influence as of traders, money-lenders and other professional men including Brahmins and those situated close to or influenced by big industrial centres are not at all suitable for locating these classes. Where, however, there is predomination of genuine agriculturists, actually tilling their own lands, these classes have appealed to them and have been very popular in spite of the opposition indirectly offered by some of the ordinary staff members, notably the Head-Masters. The District School Boards to whom the administration of these classes has now been entrusted, being new to this work and having no technical officer on their staff, the agricultural

teachers do not get timely aid and advice, which is very frequently needed at the beginning. Besides this, there are a few other practical difficulties, viz.:—

- (1) Apathy of the Local Inspecting Staff.
- (2) Improper selection of teachers and inadequate agricultural training given to them.
- (3) Lack of stimulus for work to the agricultural teachers.
- (4) Want of propaganda.

Unless these difficulties are intelligently overcome, it is not likely that these classes will thrive so as to make the movement very popular.

General.—In order that these classes may be conducted on fairly uniform lines and that they may have the advantage of frequent technical advice, the need of local officers for each Division is keenly felt.

R. Y. HULKOTI,

Inspector of Agricultural Schools, Poona.

APPENDIX S

SUMMARY OF WORK OF AGRICULTURAL PROPAGANDA IN NORTH AND MIDDLE SIND, UNDER THE DEPUTY REGISTRAR, CO-OPERATIVE SOCIETIES, SIND, DURING THE YEAR 1928-29

I held charge of the office of the Agricultural Propaganda Officer throughout the year in addition to my duties as Deputy Registrar, Co-operative Societies in Sind. The area of my activities remained the same as last year, viz., the following 11 Talukas :—

North Sind—

- | | |
|---------------|--------------------|
| 1. Ghotki, | 2. Sukkur, |
| 3. Larkana, | 4. Kambar, |
| 5. Shikarpur, | 6. Mirpur Mathelo. |

Middle Sind—

- | | | |
|----------------|-----------|--------------------|
| 1. Hyderabad, | 2. Halla, | 3. Tando Allahyar, |
| 4. Shahdadpur, | 5. Matli. | |

Propaganda Staff

There was no change in the ministerial strength of the propaganda staff also, there being 2 Inspectors and 5 Overseers working under me as last year. They all continue to do good work.

Inundation and Season

The water in the river rose early during the season (by about the 10th of May 1928) and continued rising till the 20th of June. During this period the canals began to flow quite satisfactorily except in the high level lands of Sukkur District, and Kharif operations were carried on in full swing where there was adequate water supply. From 21st to 27th June 1928, i.e., for about one week, the water receded considerably so much so that on 27th June the reading at Attock was only 17·5. This caused some anxiety which was however soon over as immediately afterwards the water rose by rapid jumps and on the 3rd July again the reading at Attock was 33 feet. Since then the river maintained a fair level throughout the season and the heavy floods and rains which occurred in the Punjab towards the close of the season flooded the river in Sind also with the result that there was good water supply right up to the end of October. As a result of good inundation the Kharif crops were very fair all round except in the cotton tracts of Districts Hyderabad, Thar Parkar and Nawabshah where they were severely hit by the boll worm, high winds and frost. In Sukkur District also the crops suffered on account of draught in the high level lands of Talukas Ubauro, Mirpur Mathelo, Rohri and Ghotki.

As regards Rabi Crop (harvested in June and July 1928) it has in its commencement progressed very satisfactorily but the frost attacks experienced in the first week of March 1928 affected it very adversely and the yield was reduced considerably.

The Rabi operations of October and November 1928 on the other hand could not be carried on to any extensive scale firstly because the kacha lands alongside the river were not, during the inundation season, flooded as usual and secondly because there was very little rainfall. There was therefore very little subsoil moisture which is so essential for the growth of Rabi crops.

The little Rabi cultivation carried on was also very adversely affected by the severe frost wave which was experienced towards the close of January last as under :—

Irrigated wheat	10	per cent. damaged.
Bosi wheat	80	" "
Grain	60	" "
Mattar	60	" "
Serial	33	" "
Jambhu	50	" "
Potato	80	" "
Sugarcane	60	" "

Rain, Fodder and Cattle

Rainfall on the whole was very poor during the year under report both during the Kharif and the Rabi seasons and hence there was scarcity of fodder all round. The cattle suffered severely and were rendered an easy prey to disease and death. The scarcity of fodder was rendered more acute by the icy wave of February last which destroyed much plantation. Owing to fodder famine the price of cattle went down very low.

Crop Pests and Cattle diseases

In North Sind.—Rust and grass-hopper attacked the rice crops in some tracts of Larkana and Kambar Talukas and did much damage to them. In Sukkur Taluka again the stem borer damaged the sugar cane to the extent of about 20 per cent. In September last the locusts visited Mirpur Mathelo Taluka but caused slight damage. Rinder pest broke out in Shikapur Taluka in June 1928 and subsided by the end of July. *In Middle Sind* the Morai and Mahlo diseases caused some damage to the cotton crops and so also the boll worm. In the paddy tracts again the field rats were reported to have done harm.

I.—Multiplication and popularization of Seeds

1. *27 W.N. Cotton.*—This variety of Desi cotton has acquired universal popularity in the cotton growing areas and the Zamindars generally make their own arrangements to get the seed from the factories. In addition to this 1,087 maunds of pure N. R. seed were distributed to cotton growers through the Taluka Development Associations of Hyderabad, Tando Allahyar, Matli, Shahdadpur and Halla. The results were as usual encouraging except for the damage done to the crops by the boll worm and high winds.

2. *American F-4 Cotton*.—This variety of American Cotton being an early ripener requires water early in March or April and hence it is not cultivable on the ordinary irrigation canals. Perennial water supply on the other hand is available only in the Fuleli Canal in Middle Sind and accordingly a beginning was made there and a few leading zamindars encouraged to take interest in the cultivation of F-4 Cotton. They indented for a fairly good quantity of the seed but it was possible to get only 1 maund and 15 seers from the Farm. The strain supplied has given very encouraging results as under :—

Being an early ripener it is harvested early and thus escapes the usual frost attacks of January and February.

The Fuleli Canal Banks abound with morai insects and as the F-4 is not susceptible to their attack, the people have begun to appreciate it considerably.

3. *Wheat*.—During the Rabi season of the year under report 635 maunds of selected strains of Pusa 12 and Thori A. T. 38 received from the Wheat Farm, Jacobabad, had been distributed amongst 9 progressive zamindars of North Sind under the Seed Multiplication Scheme as per accompanying statement (appendix A). Leaving aside the frost-bitten grain which cannot be used as seed, the total yield fit to be used as seed was 1,840 maunds. Of this the zamindars themselves have reserved 1,085 maunds to be used as seed next season as they fear they cannot get back the seed from us in the same pure state. Moreover they think it uneconomical to sell their seed to the Department at the current market rates and buy the same at enhanced rates during the sowing season. 320 maunds have been sold by the growers to their neighbouring zamindars who having come to know about the superiority of the seed thought it advisable to effect direct purchases. Written agreements have however been obtained from the original growers as also the subsequent buyers that at the next Rabi season they will sow the seed for multiplication purposes under direct supervision and guidance of the officials of the Department. The remaining quantity of 435 maunds has been purchased and stocked through the agency of the Grain Sale Society, Shikarpur, for distribution during the ensuing Rabi Season.

The popularity of Pusa 12 could be gauged from the following acreage grown under it in the 4 wheat growing Talukas of North Sind of the propaganda area :—

Taluka	Percentage of the total area grown under wheat in 1928-29	Area under Pusa 12
Mirpur Mathelo	40 per cent.	4,000 acres.
Ghotki	70 per cent.	6,300 "
Sukkur	50 per cent.	4,200 "
Sikarpur	60 per cent.	6,600 "

Rice.—During the year under report 365 maunds of selected rice strain seed, viz., Kangni, Jajai and Prong produced at the Larkana Seed Farm had been distributed among 6 enterprising zamindars, 3 in each of the two Talukas of Larkana and Kambar. The total area sown therewith was 247 acres, 199 acres under Kangni and 48 acres under the two Sugdasi varieties of Prong and Jajai. The crop grew quite satisfactorily and the seeds supplied were much appreciated by the zamindars. The total outturn was estimated at 3,415 maunds.

For the current Kharif (1929-30) 40,127 lbs. of the marginally noted selected strain paddy seed produced at the Larkana Farm have been distributed among 6 progressive zamindars under the seed multiplication scheme and have been sown by them. Results will be known after the crops are harvested.

	Lbs.
Sugdasi Jajai	5,185
„ Prong	5,891½
Kangni	29,050½

4. **Early Jwar Strains.**—A reference to early ripening Jwar strains of Achro Bazigar and Achri Turi had been made in my last year's report. 11 lbs. of Achro Bazigar received from the Research Station, Sakrand, in March 1928 had been sown on the 23rd of that month on a 5 ghunta trial plot under well irrigation in deh Arzi, Taluka Ghotki. It was harvested on the 26th of June and yielded 3 maunds of grain and 22 maunds of fodder, i.e., 24 maunds and 176 maunds respectively per acre. After the harvest also the Hari watered the stubbles and got a fresh crop of over 15 maunds fodder per plot. This early variety of jowar impressed the cultivators much due to its alluring yield of grain and fodder particularly in the slack season (when the scarcity of fodder is felt acutely all round) and ripening within a period less by at least a month than the ordinary Kharif Jwar. During the current Kharif therefore there was great demand for this seed but only 60 lbs. could be secured which have been distributed by the Association for this season to be sown in compact areas for multiplication. Almost all the seed was sown in April and has so far fared well. Further reports are awaited.

New varieties of Jwar Strains

A reference had also been made in my last year's report that 189 lbs. of Sawro Karthuho and 78 lbs. of Achi Kodri Jwars had been distributed amongst zamindars of Sukkur and Shikarpur Talukas under the seed multiplication scheme. Both the varieties germinated quite satisfactorily but subsequently suffered much owing to shortage of water and gave a poor outturn. A portion of Saoro Karthuho in Sukkur Taluka however gave a fairly good crop and yielded well, but being a late ripener there is not much scope for its expansion.

In the current Kharif season 3,389 lbs. of the marginally noted selected Jwar strains received from the Sakrand and Larkana Farms have been distributed to five promising zamindars under the seed multiplication scheme. The results will be reported next year.

	Lbs.
Acho Karthuho	595
Saoro	994
Alakh	240
Badgar	851
Red Janpur	709

5. *Berseem Seed*.—Formerly this seed used to be called for only by Zamindars of Hyderabad Taluka but now it is being indented for by Zamindars of other places also. It is growing to be popular from day to day on account of its heavy produce and good market price. During the year under report 31 maunds and 17½ seers were distributed amongst selected indentors only, as it was not possible to meet the demand of all of them.

6. *Other Seeds*.—At the request of some of the vegetable growers of Hyderabad and Matli, snowball cauliflower and white turnip seeds were sent for from Calcutta and distributed amongst them. The District Agricultural Overseer, Matli, reports to say that the cauliflowers were greatly appreciated by the public.

II.—Demonstration of Improved Implements

In accordance with the programme fixed by the various Associations the Kamgars carry a set of modern implements and demonstrate them from village to village encamping 3 to 4 days in each. During the year 198 villages were thus visited by the Kamgars in Middle Sind and 265 in North Sind. This system has successfully impressed the agriculturists with the superiority and utility of the improved implements with the result that the following implements were disposed of during the period under review :—

Sirkar Ploughs	..	..	138
Sirkar Ploughs with steel shares	..	..	77
Meston ploughs	..	..	2
Chatnooga ploughs	..	..	8
Scrapers	..	..	1
Hand Archmedian Screws	..	..	63
Bullock Archmedian Screws	..	..	13
Steel shares	..	..	117

The Kamgars during the course of their demonstrations plough the land of Zamindars on hire also with the Association's pairs of bullocks and the amount thus realized is credited to the funds of the institutions concerned. In Upper Sind 125 Jirebs were thus ploughed on rent yielding Rs. 262-0-7 while in Middle Sind the area ploughed was 77 acres and 24 ghunthas realizing a rent of Rs. 181-12-0.

The Sirkar Plough has, as already reported, become very popular but to promote its sale still further, arrangements have been made with local contractors who have agreed to sell it at a reduced rate of Rs. 6-8-0 only per plough. The people purchase the Sirkar ploughs direct from the local carpenters and contractors and no record of the actual sales is kept. One hundred steel shares for the Egyptian plough were imported through the Deputy Director of Agriculture and given out to Zamindars. These too have won universal appreciation in as much as they are very durable

on the one hand and about 5 per cent. cheaper than the local shares on the other. Another larger order for the shares is therefore going to be sent shortly for execution. The steel shares have reduced the cost of the Sirkar plough still further.

The Bullock screw lift deserves a special mention. 13 such lifts were disposed of during the year at Rs. 75 to 80 each. The mechanism of the two gears still requires some attention which is being given under expert advice to make it more useful and popular. Under the auspices of the Larkana Taluka Development Association one mistri Bhagatsing has prepared a new type of the screw. It was given a trial on 17th July 1928 and appeared to work satisfactorily. The Mechanical Engineer of the Agricultural Department has, however, suggested certain improvements to be made still which are being attended to.

The special advantage of the gear lift is that it being fixed to a wooden frame is easily removable and readjustable. For this Mistri Bhagatsing is deserving of every help and encouragement.

The other types of ploughs, e.g., the Raja Plough, Hindustan Plough, etc., have also found much appreciation though their sale would appear rather small owing to slender resources of the agriculturists due to failure of crops during the preceding two or three years continuously. Arrangements are, however, being made as pointed out above to give the benefit of every type of improved implement to the zamindars on the hire system introduced by the Taluka Development Associations.

III.—Population of Modern Methods of Farming

Drill system of cotton cultivation.—With a view to bring home to the cotton growers the advantages of the drill system, small plots (ranging between 15 gunthas to 1 acre 20 gunthas) were during the year secured in the fields of 12 zamindars of Hyderabad, Matli, Halla and Shahdampur Talukas and cotton sown in them on the drill system. The total area thus cultivated was 8 acres 25 gunthas giving a total yield of about 80 maunds. The zamindars have well appreciated the benefits of the drill system of cotton cultivation in as much as (when compared to the broad-cast system) it requires less quantity of water, involves no expenditure on hoeing and gives a greater yield.

Dry Ploughing.—During the course of the implement demonstrations carried on in the fields of the zamindars the advantages of dry ploughing are fully brought home to them. Lectures are delivered to them by the Inspectors and Agricultural Overseers and printed literature also distributed amongst them. The zamindars both in North and Middle Sind have now realized the advantages of dry ploughing very well and it will be no exaggeration to say that about 60 to 70 per cent. of the cultivated soil in the propaganda area is being ploughed up after harvest. The zamindars generally refuse to entertain a *hari* if he does not enter into an agreement to plough the land in dry condition immediately after the crop is removed.

Economy in seed rate of rice cultivation.—Like last year the Kambar Taluka Development Association repeated its experiments with the

reduced seed rate in rice cultivation. An acre plot was divided into 2 equal halves of one Jireb each in one of which the ordinary seed rate of 20 seers was used and in the other only 13 seers. The reduced seed rate plot presented during its growth equally good or even a better outlook. After the harvest it was observed that both the plots yielded equal outturns, *i.e.*, 35 maunds per acre. In the experiments of this kind carried on in previous years the reduced seed rate plots were found to give a greater yield of about 1 maund per acre. But taking the yields of the two plots to be equal the saving of 14 seers per acre in seed alone is not inconsiderable. The saving in seed rate has induced many a zamindar of Larkana and Kambar Talukas to try it on their fields and the practice is finding more and more appreciation from day to day.

IV.—Miscellaneous Activities

1. *Coimbatore Sugar Cane No. 213.*—During the year under report a new variety of sugar cane, *viz.*, Coimbatore sugar cane No. 213 was introduced in North Sind. Three prominent zamindars of North Sind, *viz.*, Seth Ladhmal, Seth Gokamal and Seth Jashanmal tried it and they as well as other zamindars have been very well satisfied with it. It was found to have a tall and upright growth of about 10½ feet, *i.e.*, about 2 feet longer than the local varieties. The growers expressed that even the passers-by were impressed with its dark green colour and tall and healthy growth. The final success of the cane depended in a large measure upon its suitability for gul-making purposes for which also requisite arrangements had been made. The severe frost however of February last damaged the crop considerably though comparatively less than the local Lahori variety. The crop of Seth Ladhmal was destroyed completely, Seth Jashanmal disposed of it wholesale while the third, *viz.*, Seth Gokamal persevered to the final issue and got gul-prepared from it. The yield of the cane itself was greater than the local variety by about 100 maunds while the gul prepared from it owing to its whiter colour and quality fetched a premium of 4 annas in the market.

The experiment is being repeated this year by Seth Gokamal who has sown about 6 guntas with this variety of cane.

2. *Popularization of Sulphate of Ammonia.*—During the year under report 220 lbs. of ammonium sulphate were distributed gratis amongst 17 progressive zamindars in Larkana and Kambar Talukas for growing rice seedlings therewith. From the enquiries it was learnt that the majority of the zamindars were satisfied with it on account of the following results :—

- (a) That the seedlings raised on the sulphate of ammonia cost less comparatively.
- (b) They grow stronger and maintain upright growth.
- (c) They do not get spoilt even if transplanted late.
- (d) Their touch is softer and they are therefore easier to pluck and transplant.

The success of ammonium sulphate as 'rab' material substitute for growing rice seedlings and top dressing of irrigated wheats has created a demand for it all round. The Shikarpur and Larkana Taluka Development Associations have therefore induced some merchants to open sub-agencies for the supply of the fertilizer and they are supplying the requisite quantity independently. 40 lbs. have been distributed gratis in Shikarpur Taluka this season for trial as rab material substitute. In Middle Sind also a demand for ammonium sulphate has arisen and steps are being taken to meet it satisfactorily.

Kambar Seed and Cattle Show.—With a view to encourage the agriculturists to grow good rice seeds and breed healthy and strong bullocks a seed and cattle show had been organized at Kambar on 6th February 1929 at the time of the Registrar's camp. The show was attended by about 1,500 people of the District but exhibits were invited from zamindars of Kambar Taluka only. In all there were 62 seeds and 83 Bullock exhibits brought in by 60 and 40 exhibitors respectively. The exhibits this year were far superior to those of last year which shows that the idea of such shows is being taken in, in the right spirit by the people.

Simultaneously with the Seed and Bullock Show the working of the various types of ploughs of the Department, e.g., Chatnooga, Poona, Sirkar and Sindhi as also the Hand screw and Bullock screw water lifts was demonstrated to the people and lectures delivered about their usefulness and superiority. Printed literature on improvements in Agriculture was also distributed broadcast. The Veterinary Graduate, Larkana, who had also been invited to the Show demonstrated the latest method of castrating the bulls.

The Show interested the audience greatly and much enthusiasm was created.

Motor Tractor Demonstrations.—The most striking feature of this year's work is that Motor Tractor Demonstrations had been organized both in North and Middle Sind. The particulars of the North Sind Demonstrations carried on from 26th April to 24th May 1928 have already been enumerated in my last year's report. The demonstrations in the propaganda area of Middle Sind lasted from 10th November to 26th December 1928 during which period 15 villages were visited and an area of 90 acres and 8 gunthas ploughed up purely for demonstration purposes. As in North Sind, the tractor commands much appreciation in Middle Sind also and will, it is hoped form a very important piece of machinery under the *post-Barrage* conditions when manual labour is bound to be very scarce and costly.

Crop Pests.—During the course of their tour the Agricultural Inspectors and District Agricultural Overseers meet the zamindars and impart instructions to them from time to time to take proper care of their crops. Guarding against crop pests is also an important item of their lectures and discussions and no stone is left

unturned whether at small meetings of Zamindars or mass meetings at the times of Shows, exhibitions or conferences, to bring home to them the dangers of crop pests and the way to meet them.

Taluka Development Associations.—The number of Taluka Development Associations remained the same as last year, *viz.*, 11 in the 11 Talukas of the propaganda area assigned to me.

It is a pleasure to remark that all the Taluka Development Associations have well nigh achieved the ideal for which they were originally inaugurated. It is through their agency that the selected seeds and implements referred to in the foregoing paragraphs have been popularized amongst the Zamindars and so also the modern methods of farming. The Associations have now gathered sufficient strength, and reckoning on the privileges of a body corporate they approach without diffidence the highest officials of the Departments who they feel will be able to redress their grievances or provide facilities for them.

Distinguished Visitors

The following distinguished visitors inspected the Agricultural Propaganda work during the year under report.

Mr. T. F. Main, Director of Agriculture, Bombay Presidency, visited Larkana on 12th January 1929 and was presented with a working report of the Larkana Taluka Development Association. He offered very valuable suggestions to the members.

The Honourable Minister of Co-operation and Agriculture and the Registrar, Co-operative Societies, Bombay Presidency, also visited Sind in January last and they too were taken round and shown the working of the Associations. They expressed satisfaction at the progress made by them.

I have the honour to be,

Sir,

Your most obedient servant

AZIMKHAN,

Deputy Registrar,
Co-operative Societies in Sind.

APPENDIX

Distribution and multiplication of Pusa 12 and Thari At. 38 Wheats

Serial No.	Name of Zamindar	Taluka	Quantity of seed given in maunds		Area sown by each in acres	Estimated outturn of each	Quantity promised to sell back to the Department		Outturn reported by the Zamindar as his share fit for seed		Kept for seed for next sowing		Disposal of his share		Remarks
			Pusa 12	Thari At. 38			Department						Distributed to other Zamindars	Sold back to the Department	
1	Seth Hassanand	Shikarpur	25	..	8	61	50	100	50	..	..	..	..	..	Thari At. 38—120 maunds he has distributed to five Zamindars for next season sowing. The rest 50 maunds Pusa 12 no good for seed.
			..	200	173	673	500	320	290	120	Nil.	..	..	..	
2	Wadero Rasulbux.	..	200	..	340	1,120	600	600	..	100	435	..	..	..	65 maunds being shrivelled grain were rejected for seed. 100 maunds he has distributed to one Zamindar for sowing next season.
3	Ghulam Rasul Khan.	..	37½	..	20	320	250	250	150	100	..	..	..	..	Distributed to three Zamindars for next season sowing.
4	R. F. Chandumal.	..	50	..	24	384	100	300	300	..	..	..	..	..	
5	Mr. Hajan Shah.	..	12½	..	5	20	The crop was very poor.	..	..	..	..	..	..	..	..
6	.. Wajid Ali	..	7½	..	4½	54	Nil.	45	45	..	..	..	..	..	..
7	Master Habibullah.	Sakkar	..	..	50	Crop badly bit by frost	..	..	..	..	..	..	..	..	rejected for seed.
8	Pir Mohd Khan	..	15	..	3	36	No good seed sowing many watering	..	..	..	..	..	..	..	..
9	Pir Rasool Shah.	Ghotki	37½	..	17	340	Nil.	340	340	..	..	..	..	..	..
		Total	385	250	..	..	..	..	1,085	320	435	..	..	..	

APPENDIX T

SUMMARY OF WORK DONE AT THE AGRICULTURAL RESEARCH STATION,
SAKRAND, DURING THE YEAR 1928-29

Administration.—I held charge of the post of the Officer in charge, Agricultural Research Station, Sakrand, throughout the year under report, in addition to my duty as Agricultural Chemist and Soil Physicist.

For the present the following three sections have been organised at this Station :—

- (1) The Agricultural Section proper.
- (2) The Botanical Section.
- (3) The Chemical Section.

All the three sections are in close touch with each other. The main function of the Agricultural section is, to bring on Scientific basis the methods of cultivation followed by practical farmers and, to bring on practical scale the results of researches found in other sections.

This is being well achieved at this Station. For instance, the Bosi method for the cultivation of wheat, which is followed in north Sind, has been so modified to suit Barrage conditions that it is advantageous both to the *Zamindars* and to the irrigation Department. After the Barrage is opened the water supply will be perennial. It is anticipated that a larger quantity of water will be available for Rabi season from October in every year than can be immediately used for sowing wheat, for which the best time is after the middle of November. But experiments carried at this Station on experimental plots under controlled conditions and on large field scale proved that a large quantity of water can be applied to the land in October and can be conserved till middle of November. A light dose of irrigation may then be given before sowing wheat so as to ensure good germination and then the regular irrigation, as desired, can be given to secure full yield.

Chemical determinations of the capillary and total moisture contents in soil samples taken from the Botanist's area, where measured quantity of water was given to a definite area on the principle of the above modified Bosi method of cultivation, showed that the moisture can be well stocked in the lower two feet of the soil. Only the surface 6" of the soil loses a larger quantity of water which can be replenished by a small dose of irrigation to ensure good germination; later on, as the roots go down they find sufficient moisture for the proper development of the plant.

The above is only one instance out of many in which the complete co-operation of all the sections have conduced to the general good.

The Sections have been mostly staffed with promising research workers, who, with more encouragement and appreciation, are capable of turning out a good amount of research work.

Climate.—The highest temperature attained during the year under report at this Station was 118° F during May 1928 and the lowest temperature was 20° F on the 1st of February 1929. The latter was unusual and was due to the abnormal severe cold wave sweeping over the country. The usual minimum temperature is about 30° F.

Rainfall, which is usually negligible was 2 inches only. The real oppressive weather prevails in July and August, when high temperature is attended by closeness of weather. Such days however are not many.

Health of the Station.—The health of the Station has greatly improved during the year under report. This is mainly due to the much better water supply than last year, when water from a *kaccha* well, almost unfit for drinking purposes, was being freely used.

Visitors.—The Collector of Nawabshah and some *Zamindars* are among the usual visitors to the Farm.

During the year under report four demonstrations were organised for *Zamindars* from four *Talukas*, viz., Hala, Hyderabad, Shahdadpur and Nausharo Feroz. These demonstrations were well attended to and the *zamindars* took keen interest in the demonstrations. The one thing, that struck the cultivators most, was the improvement of crops by cross fertilization of which the cultivators had hardly any idea.

A party of students from the Agricultural College, Poona, along with their Professors paid a visit to the Station.

The Chief Engineer, the Superintending Engineer and the Land Revenue Officer, Lloyd Barrage, paid a visit to the Farm. Their visits to the Farm bring Barrage Officers and Officers of this Station in close touch.

The Honourable members of the Bombay Legislative Council paid a visit to the Station and took a lively interest in the work of the Station. The Honourable Minister for Agriculture, the Honourable the Revenue Member and the Revenue Secretary also inspected the work carried on at this Station.

Requirements.—The requirements of this Research Station are many. It has no Library worth the name. A good library is most essential for a research station. The Laboratories are not fitted up with a gas plant. The pumping engines are not yet provided with a shed and are exposed to the hot sun and the dust storms of Sind.

A bullock shed, an implement shed and coolie quarters are required to house the cattle, implements and the permanent labourers respectively.

A power gin to gin the various cottons of the Farm and a threshing machine for wheat are also necessary at this Station to ensure a pure seed supply of the two main crops under the Barrage area. These are only some of the urgent requirements of the Station.

V. A. TAMHANE,
Officer-in-charge,
Agricultural Research Station, Sakrand (Sind).

ANNUAL REPORT OF THE AGRICULTURIST, AGRICULTURAL RESEARCH STATION, SAKRAND, DURING THE YEAR 1928-29

I—Administration

As a result of the development of the main Farm by the end of the year 1927-28 and initiation of a new set of field-scale experiments, the appointment of the Agriculturist was created and I took over charge of that office on the 18th April 1928. Mr. N. B. Chowdhri filled the vacancy of the Graduate Assistant caused by the transfer of Mr. Daryani to Propaganda line, in May 1928 and Mr. Parumal joined the establishment as the Accounts Clerk on the 9th June 1928. Other establishment continued to be the same as in the previous year.

II—Season

The highest maximum temperature recorded on the Station was 118° on the 24th May 1928, while the lowest minimum temperature was 20° on the 1st February 1929. The rainfall, during the year, amounted to 2" only, and was distributed in 5 small showers, which were hardly of any benefit to the crops.

The cold wave which visited Sind, during the last week of January and 1st week of February 1929, caused a considerable damage to Rabi crops, fruit trees and forest growth. Early sown Wheats, Gram, Potatoes and Sugarcane were severely hit by the frost, but late sown Wheats, Onions, Jambho and Rape (also late sown) and Safflower escaped. The superstructure of Berseem was killed, but the roots were not affected, consequently the new growth came up rapidly. Same was the case with Lucerne.

Of the tree growth, *Sessbania egyptica*, Oliander, Babul, *Salvadera persica*, *Caparis aphylla*, etc., lost many years growth.

III—Water Supply

The Station is equipped with 2 sets of pumping plants, driven by 6 N. H. P. Portable Steam Engines and one turbine pump fitted in the Tube well of 149 feet depth. Each pump is capable of discharging 2 cusecs (750 gallons per minute). During the year under report the pumping sets worked for 4,921½ hours and discharged 6,052·5 acre inches. The running cost of pumping including wages and repairs, amounted to 7,111-2-5 consequently the cost per acre inch works out to Rs. 1-2-9 only.

Dhand (Lake) water was available for 10 months only, consequently for the remaining 2 months (April and May), tube well was the only source of water supply which however was not commensurate with the requirements.

This is not a satisfactory arrangement, especially when a definite quantity is fixed for the holdings and the problems relating to perennial irrigation are to be investigated. Sinking of another tube well therefore is an obvious necessity.

IV—Research and Experiments

In the 9th paragraph of the last year's report, it has been mentioned that an extensive programme of field experiments is laid out in order to investigate agriculturally the problems arising out of the perennial, irrigation. Of these, the most important problems, that have been taken up for investigation are detailed below :—

1. Kalar Reclamation.
2. Maintenance of Soil Fertility.
3. Testing of Project Duties and Schemes.
4. Introduction of paying varieties and new crops.
5. Devising improved methods of cultivation and testing Implements and Machines.

1. *Kalar Reclamation.*—Three holdings containing varying intensity of salts, are set apart for this purpose. Sakrand A deals with a highly intense concentration of salts, while Sakrand B and C deal with medium intensity of salts. The principle underlying these experiments is concentration of cultivation on a smaller area for which the permissible quantity of water is sufficient and cultivation of Berseem (in Rabi) which is recognized to be a kalar resistant crop. The lay-out in these experiments is the well-known Egyptian lay-out which consists of digging a drain on all the four sides of the 2 acre plots and also on either side of the water course. This lay-out has two advantages, viz. (1) that the salts are confined in small size plots, to be easily driven down or treated and (2) that the salt advancing from the water courses which is the main source of kalar infection, are cut off from infecting the land.

The results obtained from these experiments are detailed below :—

Sakrand A.—This experiment was commenced with Rabi crops and Berseem was grown all over the 16 acres. A herd of 50 buffaloes and bullocks grazed on the green growth four times during the season. The average yield of green Berseem amounted to 300 maunds. (Maund=82 lbs.) per acre. The crop received 9 waterings, and the total delta amounted to 439.3 acre inches. This works out a duty of 143 as under :—

$$\frac{2 \times N}{\Delta} = \frac{9 \times 164}{27.4} \times 12 = 143$$

Sakrand B.—In this experiment both Kharif and Rabi crops were cultivated. The yields are as under :—

			Remarks.
Cotton	..	612 lbs. per acre.	} Crop patchy on account of Kalar except Bajri which occupied good land.
Jowar	..	953 lbs. do.	
Bajri	..	1,485 lbs. do.	
Wheat	..	545 lbs. do.	
Berseem	..	Grazed four times.	

The duty worked out is tabulated below :—

Total cropped area in Kharif.	Total Delta.	N.	D.
12	383·5	125	= 94

Rabi duty obtained from this experiment is as under :—

	Total Delta.	N.	D.
Berseem .. 10 Acres	267	165	148
Wheat .. 4 Acre inches	77	152	190

Cotton received 8 acre inches for initial soaking and 7 subsequent waterings at 3 acre inches per acre per watering, Jowar and Bajri 8 inches for soaking and 6 waterings of 3 acre inches each. First watering was given 30 days after sowing. Wheat received 8 acre inches for soaking in the first fortnight of October and 4 subsequent waterings of 3 acre inches each. The crop was sown on the 20th November.

Sakrand C.—In this experiment, both Kharif and Rabi crops were cultivated. The yields obtained are detailed below :—

		Remarks.
Cotton ..	579·5 lbs. per acre	Crop patchy on account of salts.
Jowar ..	966·7 lbs. do.	
Bajri ..	711 lbs. do.	
Wheat ..	846 lbs. do.	

Berseem yielded 4 cuttings which were grazed down on the field. The duty obtained from this holding is as follows :—

	Area.	Delta.	N.	D.
Kharif ..	16	545·8	144	101
Rabi ..	8	159	162	196
Berseem ..	11	343	164	126

Cotton received 8 acre inches for soaking the land and 7 subsequent waterings ; Jowar and Bajri having much kalar received 12 to 16 acre inches for soaking the land and 5 to 6 subsequent waterings ; wheat received 8 acre inches for soaking the land and 4 subsequent waterings ; and Berseem 8 waterings in addition to 7 acre inches of initial soaking.

2. *Maintenance of Soil Fertility.*—Sakrand System D consisting of 16 acres and having a fixed discharge of '043 or 15·5 acre inches in 15 days deals with the problem of soil deterioration due to continuous cropping without rest or manure. The rotation is so arranged that Berseem follows cotton in the following year. Berseem like all other leguminous crops enriches the soil with this difference that it can be grazed to cattle on the land several times during the season and thereby excreta of the animals are added to the soil.

The results are tabulated below :—

Crop.	Per acre.	Remarks.
Cotton	.. 1,302 lbs.	
Jowar	.. 1,132 lbs.	
Guwar	.. ..	Fed Green
Wheat	.. 1,152 lbs.	
Berseem	.. ..	Gave four cuttings.

The duties obtained from these experiments are detailed below :—

Crop.	Area.	Delta.	N.	D.
Kharif ..	4 acres	94	115	117
Rabi ..	4 acres	88.7	163	176
Berseem ..	2 acres	71.7	148	99

The area of 5 acres assigned for the artificial manure experiments was cultivated with fodder Jowar in kharif and Wheat in rabi with the object of exhausting the soil. Jowar yielded 19,280 lbs. of green fodder per acre which was fed to the cattle and Wheat 839½ lbs. of seed per acre.

3. *Testing of Project Duties and Schemes.*—Two holdings of 16 acres each have been laid out with a fixed discharge to try the intensity of the second decade and work out the suitable intervals and doses of irrigation for the crops. One of the holdings, viz., Sakrand E (salt land) includes salt infected land on which possibilities of cultivating ordinary crops without reclamation are being investigated. The results obtained from the salt land are summarised below :—

Crop.	Yield per acre.	Remarks.
Cotton 4F	.. 72.3 lbs.	Very poor stand on account of salt.
Jowar	.. 1,268 lbs.	
Guwar and Bajri	.. ..	Completely failed.
Wheat and Jambho	.. ..	Not yet threshed.

Results from the sweet land are given below :—

Cotton 4F	.. 786.3 lbs.	
Jowar	.. 1,236 lbs.	
Bajri	.. 518 lbs.	
Guwar	.. 1,280 lbs.	Green Fodder.

Rabi produce is not yet threshed.

In this experiment commencing from April, it seems possible to give 16 to 20 acre inches for initial soaking for cotton cultivation and 8 subsequent waterings of 3.5 acre inches at the interval of 15 days, the first watering being given 30 days after sowing. Jowar, Bajri and Guwar require 8 acre inches for soaking and 5 to 6 waterings up to the end of September. Wheat, Rape and Gram have ample water in the second decade and it is quite possible to give 8 inches initial soaking and 16 to 20 acre inches in 4 subsequent waterings, leaving still some surplus in reserve.

4. *Introduction of paying varieties and New Crops—Cotton.*—A variety of Punjab American has succeeded well in Sind and until some other type with longer staple and higher yield is evolved this variety will expand in the cotton tract. It is early maturing and practically finishes off before X'mas when frosts frequently occur. It has yielded 1,302 lbs. per acre on average good land on large scale cultivation.

Jowar Saoro Kartuho and Acho Kartuho.—These two strains of the Botanical Section are promising varieties. The yields obtained from these were 1,009 and 1,024 lbs. respectively.

Pusa 12.—This variety is one of the strong wheats which grows well in Sind. It is early ripener and rust resistant. It should be sown in the 2nd fortnight of November in order to delay its flowering time beyond the 1st week of February when late frosts usually occur.

Berseem.—This crop is useful for kalar reclamation, as well as for maintenance of soil fertility as already explained. It is sown in standing water with 40 lbs. seed rate per acre, in the 2nd fortnight of October and yields 4 to 6 cuttings of first class succulent and very palatable green feed which is eaten with avidity by the cattle of all sorts. For seed production purpose, the crop is reserved after second cutting from not later than the 7th February and watered regularly till the crop ripens. It is harvested in the first week of June.

Tobacco.—Superior varieties of Tobacco have been obtained from Nadiad and Pusa, which will be tried in comparison with the local variety which has already grown satisfactorily on the Farm.

Groundnut.—Two varieties, *viz.*, Spanish Pea-nut and Big Japan were tried during the year and yielded 1,020 lbs. and 1,376 lbs. per acre respectively. Spanish Pea-nut is an early ripener.

Sugarcane.—C. O. 213 from Coimbatore selections was tried during the year and yielded 52,800 lbs. of cane per acre. The juice tested on 26th January 1929 by brix saccharometer recorded 19°. The crop was however so badly affected by the frost that all the eye buds on the canes were killed and the juice deteriorated.

Potatoes, Onions and Safflower are other crops which were tried on the Farm and of which potatoes were damaged by the frost. Onions and safflower yielded 9,780 lbs. and 896 lbs. per acre respectively.

5. *Devising improved methods of cultivation, etc.*—Sowing cotton by drill method and hoeing by the bullock power was tried on a large scale. The economy effected in hoeings of cotton and the security gained against the scarcity of labour which is commonly felt at the time of hoeing, are two important considerations which make the introduction of this method a boon to the cultivator.

Under the post barrage condition irrigation for soaking wheat land will be available from the month of October but sowing of wheat in this month would be too early. The best time for sowing wheat in Sind is the whole month of November, although the second fortnight of November is more safe because the resulting crop flowers, after the late frosts

have passed off, and hence escapes damage. In order therefore to utilise October irrigation for wheat cultivation, it becomes necessary to adopt methods for conserving moisture in the soil till the seeding time. It was practically demonstrated during the year under report in Sakrand B and C systems that October soaking could be effectually retained in the soil and that a normal crop could be secured. The method adopted was ploughing the irrigated land when it came in condition twice or thrice after short intervals and passing a light Samar (Plank) after every ploughing in order to pulverize the clods and make a fine mulch on the surface. One more Samaring before drilling the seed in November brought up "Rej" (Moisture) for germination purposes. If a light watering about 2" is given just before sowing, the moisture contents in the upper layer of soil will increase and a uniform germination will be secured.

V—Demonstration and Propaganda

As a result of the activities of this Station the following quantities of the pure varieties of seeds were distributed for sowing purposes during the year under report :—

Name of variety	Quantity	Remarks
	Lbs.	
<i>Jo ar—</i>		
Saoro Kartuho	1,581	
Acho Kartuho	1,478	
Alakh	512	
Red (Fodder)	680	
Bagdar	410	
Red Janapur	565	
<i>Cotton—</i>		
27 W. N.	720	
4 F.	82	
<i>Wheat—</i>		
Pusa 12	1,380	
C. P. H. 47	3,125	
A. T. 38	3,855	
G. S. 25	3,526	
Punjab 11	1,632	
Spanish Pea-nut	82	
Big Japan	82	
Paddy Dadkanie	148	

M. U. BARAKZAI,

Agriculturist,

Agricultural Research Station, Sakrand (Sind).

**ANNUAL REPORT OF THE BOTANIST, AGRICULTURAL RESEARCH STATION,
SAKRAND, FOR THE YEAR 1928-29**

Organisation.—I held the charge of the office throughout the year and controlled the botanical work of the Sind Department proper. The botanical work in Sind is carried out at Sakrand, Larkana, Mirpurkhas and Jacobabad. Improvement of four principal crops, *viz.*, Cotton, Wheat, Rice and Jowar, is in hand.

2. *Future Cotton of Sind.*—Satisfactory progress has been made towards the production of a suitable type of stapled cotton for Barrage conditions. The following table will show the improved and promising strains in hand and their important characters :—

Type.	Variety and Strain No.	Staple in inches.	Gin- ning per cent.
Punjab American	4F Nos. 18 and 98 ..	$\frac{3}{8}$	34
Do.	285 F Nos. 1, 2 and 30 ..	1	30
Egyptian cotton	Boss III Nos. 16, 18 and 19	$1\frac{1}{8}$	33
Do.	Ashmoni Nos. 14, 16, 32 and 37.	$1\frac{1}{8}$	34
Imported American	Acala Nos. 11, 27, 35 and 70.	$1\frac{1}{8}$	34
Do.	Hartsville Nos. 10 and 111.	$1\frac{1}{8}$	29
Hybrid 285F × Sea Island ..	Nos. 168 and 192 ..	$1\frac{1}{8}$	31
„ 285F × Pima	Nos. 61 and 35A ..	1	31

The Punjab-American cottons stand first in point of hardiness and yield per acre; the other strains of American and Egyptian cottons are also fairly hardy and prolific; they are in the process of acclimatisation.

3. *Agronomic Investigations.*—(a) *Field Trials and Date of Sowing Experiments.*—Five promising varieties of cottons were compared in replicated tests arranged in the form of a chess board. All of them were sown on flat except Ashmoni which was sown on ridges. The following table will show that 27 W. N., *Deshi* and 4 F cottons are capable of yielding twice as much as the unacclimatised long stapled exotic cottons and that the early sowing (late April) has given very much better results than later sowings in May and June.

Table No. 1

Mean yield of seed cotton in lbs. per acre (average of 3 replications).						
Date of sowing.	27 W.N. Desbi	Punjab Americans.		Acala American.	Ashmoni Egyptian.	Remarks.
		4F	285F			
23rd April	2217	1466	1524	901	785	There were 5 replications of each under each sowing date. Of these, two were rejected; size of plot was 5/16 acre.
11th May	1648	1679	1189	654	826	
17th June	1531	1257	961	661	255	
Average	1798	1467	1224	735	722	
Comparative Yield Ratio.	2.4	2.0	1.6	1	1	

Another experiment in which cottons were sown on ridges, also showed that the early sowing (19th April) gave better results as will be seen below :—

Table No. 2

Date of sowing.	Yield of seed cotton in lbs. per acre.		Remarks.
	285F	Ashmoni	
19th April	2033	935	There were 6 replications of each variety under each sowing date. Size of plot was a little more than 1/40th acre.
13th May	1610	682	
17th June	1061	316	
Average	1568	643	

When the yield of 285F cotton sown on flat (*vide* table 1) is compared to the yield of the same cotton on ridges (*vide* table No. 2) there seems to be an indication that the yield is greater on ridges than in the flat sown beds.

(b) *Row Tests of newly imported Cottons.*—Three newly imported American cottons, *viz.*, Hartsville, Acala and Durango were tried in alternate strips of 4 rows each, replicated 4 times showed that

Hartsville gave as much yield as 285F and Acala yielded less. Durango cotton showed poor opening of bolls and hence is not worth retaining for future trial.

4. *Botanical Investigations.*—(a) *Selection and Hybridisation.*—The work of breeding a long stapled cotton suited to Sind conditions by selections from Egyptian and American cottons and also by hybridisation between the hardy 4F cotton and long stapled exotic cottons as reported last year has progressed satisfactorily and is being continued. Besides this, maintenance work in established strains of *Deshi* and Punjab-American cottons was carried out at Sakrand and Mirpurkhas.

(b) *Special Problems in Cotton.*—The phenomenon of non-dehiscence of anthers in all the early formed flowers which consequently shed, was first noticed at Sakrand in 1926 and the observations were confirmed in the following year. Similar observations were recorded at Mirpurkhas during the season under report. It was found that most of the flowers opening in the months of June and July in the various sowings made from 18th March to 17th May, were quite normal and only a small percentage varying from 11-19 showed non-dehiscence; this differentiating behaviour in the two places may probably be due to differences in climate, Central Sind represented by Sakrand being more dry and hot than East Sind represented by Mirpurkhas. Seed development during the season was quite normal; the last pickings showed immature seed.

(c) *Flowering and Bolling.*—Observations recorded at Mirpurkhas showed that intensive flowering in 4F cotton sown on 29th March took place in September; whereas in the plot sown a month later, it occurred in October. In both cases 44 per cent. of the flowers appeared during the month of intensive flowering. In spite of the fact that dehiscence of anthers in the early formed flowers was normal, most of these flowers formed up to August in early sown (19th March) plot were not successful. The late sown plot (29th April) showed better success in the June and July flowers but August flowers were entirely lost. Greatest success was noticed in September flowers in both the plots, being about 30 per cent. October and November flowers were almost entirely lost in both the sowings probably due to boll worm attack. The final result was that the number of bolls picked per plant in late sown plot (29th April), was much less than half that of the early sown plot (29th March). It appears that early sowings in East Sind are likely to be more profitable especially in a year when boll worm appears.

(d) *Shedding.*—This occurs in the form of buds, open flowers and developed bolls. Bud counts were not taken but counts of open flowers and bolls in plants sown on 29th March recorded at Mirpurkhas showed that 85 per cent. of flowers shed, out of which 76 per cent. fall in form of flowers and about 9 per cent. in form of green bolls.

5. *Incidence of Diseases.*—During the season, Lucerne caterpillar "*Lopigma exigua*" appeared at Sakrand in the early stages and pruned a large number of plants but it was soon destroyed by a heavy shower of rain. White ants did much damage especially in Egyptian cottons at Sakrand. Boll worm was not much noticed at Sakrand but did lot of damage at Mirpurkhas. 4F cotton sown on the Mirpurkhas Seed Farm on 29th March seemed to escape damage ; while the latter sowings appeared to have been badly affected.

Research on Wheat

6. *Agronomic Investigations.*—The following experiments were carried out during the year under report. The results were somewhat vitiated by the unprecedented frost which occurred in early February.

(a) *Effective Sowing Season.*—Sowings were made on three different dates, viz., early November, mid-November and early December. Both the November sowings were affected by frost. The general conclusion is that the optimum time of sowing for Sind wheat and Pusa 12 is from third week of November and onward. The early December sowing gave a yield of about 1,500 lbs. grain per acre.

(b) *Optimum Seed Rate.*—40, 60 and 80 lbs. of seed per acre were tried at Sakrand. The results obtained are not decisive but indications were that 40 and 60 lbs. seed rate in case of C.Ph. 47 and Pusa 12 respectively gave better results under irrigated conditions. On the other hand it was found at Jacobabad that under Bosi conditions higher seed rate, viz., 80 and 100 lbs. in the case of A. T. 38 and Pusa 12 respectively gave better results than 60 lbs. seed rate.

(c) *Suitable Date of utilizing Canal Water.*—Kharif crops as a rule do not require irrigation beyond mid-October, whereas the optimum sowing period of wheat commences in third week of November. The following experiments were therefore conducted to determine how far canal water available in October-November can be utilised for flooding wheat land, the seed being sown at the usual time.

Table No. 3

Experiment No.	Date when water was utilized.	No. of waterings after sowing.	Period of irrigation in days.	Delta of water applied acre inches.	Plot duty	Yield of grain in lbs. per acre.
1	5th October	4	154	19	195	1380
2	22nd October	4	137	19	173	1653
3	7th November	4	122	19	154	1644
4	7th November	3	122	14	209	1489

Experiment No. 1 was damaged by frost to a greater extent than others. The results suggest that October-November supply of water

could profitably be utilized for wheat. The land may be flooded and water stored into the soil by repeated ploughing and 'samaring' (rolling with plank roller) and seed may be sown at the proper time even three weeks later. A light dose of water may be applied just before sowing to wet the dry surface. It was further found that 19" delta of water applied during the season gave a full crop; any reduction in it was detrimental.

(d) *Variety Trials*.—Selected strains of Sind wheats, viz., C.Ph. 47, A.T. 38 and G.S.25 have been declared to be decidedly more high yielding than Pusa 12. Similar results were obtained during the year under report both in early and late sown plots. C.Ph. 47 gave 2056 lbs. of grain per acre; A.T.38, 1750 lbs.; G.S.25, 1641 lbs.; Punjab 11, 1543 lbs. and Pusa 12, 1534 lbs. per acre in a plot sown in early December.

(e) *Adaptation and Acclimatisation*.—Among the several Pusa and Punjab wheats tried, Pusa 52 and Punjab 8 A were found to be promising. An exotic wheat called No. 1 Northern Manitoba was sown on 19th November. It grew luxuriantly but the grain was not on the whole fully developed. It is proposed to try it again next season by sowing it early.

7. *Botanical Investigations*—(a) *Improvement by Selection*.—Three selected strains of Sind wheats, viz., C.Ph.47, A.T.38 and G.S. 25 have now been established and have maintained their characters for high yield and good quality. New selections have been made. Further examination of village samples received from Upper Sind showed that the field of selection has well nigh exhausted.

(b) *Improvement by Hybridisation*.—F1 generation of the crosses reported last year was grown during this season. The F1 hybrid C.Ph. 47 × G.S. 25 was particularly vigorous. The inheritance of various characters has been recorded.

(c) *Quality and Nitrogen Contents*.—The Choice White Karachi wheat exported from this country was found to contain 1.58 per cent. nitrogen whereas the selected strains and Pusa 12 gave a nitrogen per cent. from 2 to 2.5. A trade sample of Manitoba No. 1 Northern gave 2.3 per cent. nitrogen. Good quality wheats are said to contain nitrogen above 1.9 per cent. It therefore appears that the Choice White Karachi wheat exported abroad has given Sind a bad reputation whereas Sind is capable of growing superior quality wheats without any loss in yield per acre.

(d) *Classification*.—13 more types of wheats were added to the already existing collection of Sind wheats reported last season. The scheme of classification and description has now been completed.

(e) *Bosi Wheat*.—Satisfactory progress has been made in the selection work reported last year and the investigations carried out at Jacobabad are being reported elsewhere.

Research on Jowar

8. *Improvement by Selection*.—In a replicated test Saoro Kartuhio Strain No. 1 gave 18 per cent. more yield of grain than ordinary village

seed and the standard error of the difference showed that results could be safely relied upon. Other strains, viz., Bagdar No. 1; Achho Kartuhio No. 1 and Janapur No. 3 were tested with Saoro Kartuhio No. 1 and were found to be fairly equal. Further selection from village samples was continued and out of 63 line cultures, 22 have been retained for further trial.

9. *Improvement by Hybridisation.*—F₁ generation of the following crosses was grown :—

- | | |
|-----------------------|----------------------------------|
| 1. Torh × Bagdar | To combine heavy weight of grain |
| 2. Torh × Achho Kodri | of Torh with large number of |
| 3. Torh × Allakh | grains in the other varieties. |

The inheritance of various characters has been recorded.

10. *Variety Trials.*—The following table will show the results :—

Variety.	Yield of grain in lbs. Average of 5 replications.		Maximum yield per acre.	Days to ripen.
	Per plot.	Per acre.		
Bagdar No. 1	141.9 ± 6.5	1773	2325	101
Saoro Kartuhio No. 1	136.4 ± 14.8	1706	2900	110
Janapur red No. 3	133.7 ± 11.8	1671	2375	111
Allakh No. 2	132.2 ± 5.3	1653	1875	103
Achho Kartuhio	110.3 ± 9.9	1379	1825	98

Saoro Kartuhio No. 1 is on the whole the best Jowar in Sind from point of yield and adaptation; Bagdar has spotted grain which is not liked. Allakh has superior quality of grain which is pearly white.

11. *Natural Crossing.*—This was found to occur to the extent of 0.8 per cent. Natural hybrids are however found. A natural hybrid between white and red grain produced 36 red, 77 medium and 22 whites in its progeny.

12. *Study of Hereditary Characters and Classification.*—A number of constant characters were studied in pure lines. The scheme of classification of Sind Jowars reported last year has now been completed.

Research on Rice

13. This is being conducted at Larkana. Of the three established strains Kangni 27 is being multiplied on a large scale; the yield per acre obtained in the breeding patches was 2,332 lbs. for Kangni 27, 1,668 lbs. for Prong 36 and 1,080 lbs. for Jajai 77. Further selection from village samples is being continued. Maintenance work of pure strains was also carried out as usual.

14. Rices possessing special economic characters are being maintained.

15. Varieties obtained from Gujarat and Madras were found to be very late and unsuitable for Sind conditions. Of the exotic varieties so far tried, Bara rice from Peshawar and Basmati from Dheradin are being maintained.

16. F1 generation of the crosses reported last year was grown during the year under report. The inheritance of various characters recorded showed that the prospect of getting an improved type from these hybrids is great.

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**ANNUAL REPORT OF THE AGRICULTURAL CHEMIST AND SOIL
PHYSICIST, AGRICULTURAL RESEARCH STATION,
SAKRAND, FOR THE YEAR 1928-29**

This section was established in Sind for the first time at Sakrand at the end of the year 1926 and had therefore no sufficient accumulated data to guide its line of work in the various branches of Chemistry and Soil Physics.

The work carried on in this section can be divided into the following general heads :—

- (1) Research on soils.
- (2) Research on *kalar* reclamation.
- (3) Research on the movement of soil moisture and soluble salts.
- (4) Research on the water requirements of crops.
- (5) Observations on the sub-soil water levels in bore holes.
- (6) Research on the lateral movement of water from a water course.
- (7) Soil survey of the Farm area.
- (8) Miscellaneous.

Research on Soils

The soils of Sind are formed of the deep, alluvial deposits of the Indo-Gangetic plain. A cross section shows alternate layers of silt and sand of different thickness often impregnated with salts.

Determinations of the Hydrogen-ion-concentration of a number of soil samples at this Station show that the pH value of the soil varies a good deal but is in general between 8.5 to 9.5. Growth of crops, especially of cotton, on soils having pH value 9 to 9.5 is extremely poor whereas good growth of the crop was attained on soils having pH value up to about 8.8.

Determinations of organic nitrogen and loss of weight on ignition of the soils show that the quantity of organic matter present in the soils is low. Formation of nitrates in the soil, however, is not defective and the lime contents of the soils are good.

The maximum water holding capacity of the soils in general is low, ranging from about 40 to 60 per cent. Their sticky point is also low. Similarly, their absorption capacity at 50 per cent. relative humidity is extremely low as also the Hygroscopic moisture. All these tests show that the soils do not contain a sufficient amount of colloidal material or organic matter to preserve the soil fertility over a longer period of cultivation.

Water extracts of the soils, however, are generally rich in soluble matter, mostly due to the accumulation of the decomposition products in the soil caused by the excessive heat of long summer and absence of rain which would remove them. Concentration of soluble salts over 0.5 per cent. containing mostly injurious sodium salts, is, generally harmful to the crops.

Research on Kalar Reclamation

Permanent reclamation of *kalar* lands is an extremely difficult problem except with underground drainage which is a very costly operation. Even in the Szik lands of Austria-Hungary where reclamation experiments without drainage have been in progress for several decades, the results, though hopeful, have not been very satisfactory and conclusive.

In Sind there are two relieving factors as regards *kalar* reclamation. First the absence, in general, of the most obnoxious salt, *viz.*, Sodium Carbonate and secondly the presence of a sandy layer in the soil helping to remove the salts by leaching.

In the absence of the underground drainage the following two methods are being tried at Sakrand :—

(1) To drive down salts with a larger quantity of water so as to ensure the raising of crops.

(2) Addition of Calcium Chloride to convert the Sodium complex of the clay material to Calcium complex and render the salts less injurious.

In the first method, *i.e.*, leaching or driving down salts by flooding, four experiments were tried, *viz.*, initial flooding of 8", 12", 16" and 20" of water on soil containing about 1 to 1.3 per cent. of soluble salts and sowing the crops as usual; the remaining treatment was similar in all cases. The yield of seed-cotton obtained per acre in the four plots was 636, 1198, 1236 and 1847 lbs. respectively showing that an initial dose of 8" over the soil containing more than 1 per cent. of salts was not effective; a dose of at least 12" is necessary to get a fairly good yield. Similar results were obtained in case of *Jowar* and *Bajri* but the difference in yield was more marked in the case of cotton than in the case of *Jowar* and *Bajri*.

In the second method, Calcium Chloride at the rate of 1 ton, $\frac{1}{2}$ ton, and $\frac{1}{4}$ ton to an acre was added to the soil in the year 1927 on three plots of 2 $\frac{1}{2}$ gunthas each and three similar plots were left as control without any treatment. During the year under report no more Calcium Chloride was added, as the effect is supposed to last for three years, but cotton was sown as in the previous year.

In the first year of the trial the effect of addition of Calcium Chloride on soil containing from 1 to 1.5 percent. of salts was very marked on a strip of *kalar* running across all the six plots. In plots treated with Calcium Chloride there was good germination, whereas on the *kalar* strips in plots kept as control, without addition of Calcium Chloride, there was no germination. Determination of the Hydrogen-ion-concentration showed that the treated plots had pH value = 8.8 whereas the untreated plots had pH value over 9.1.

In the second year, *i.e.*, the year under report the effect has not been so distinctly marked probably because, by the irrigation water applied to all the plots during the last year the salts in the untreated plots also were sufficiently washed down.

This year all the plots have yielded much less than last year, the control plots giving almost as good yield as the treated plots and in certain cases even a little better than the treated plots, as will be seen from the figures of yield of cotton for the last two years :—

		Calculated yield per acre of seed cotton in lbs. in the year.	
		1927	1928
Plot IA treated with 1 ton CaCl_2.	.. ..	1,956	860
IB control without CaCl_2.	.. ..	1,331	880
Plot IIA treated with $\frac{1}{2}$ ton CaCl_2.	.. ..	1,287	820
IIB control without CaCl_2.	.. ..	1,351	864
Plot IIIA treated with $\frac{1}{4}$ ton CaCl_2.	.. ..	1,873	888
IIIB control without CaCl_2.	.. ..	1,556	784

The plots are kept under trial for the third year which will complete the tests.

Research on the movement of soil moisture and soluble salts

Results of single dressings of irrigation water at the rate of 8", 6", and 4" per acre were given in the last year's report. Summary of the results of repeated dressings of water on soil containing about 3 per cent. of initial moisture and 1 to 3 per cent. of salt contents are given below :—

1. An initial dose of 4" of irrigation water (accompanied by 4.83" of rain and) followed by a dose of 2" of irrigation water every 10 days, raised the water contents of the soil up to the depth of 5 feet more quickly than equal quantity of water (28 inches in all) given at the rate of 3" every 15 days.

2. When the same quantity of water (28 acre inches) is applied to the soil in a period of over three months the largest quantity of water found in the soil (*e.g.*, 23 to 25 per cent.) up to a depth of 5 feet, at the end of the period, is also obtained by the application of smaller doses of water given at shorter intervals (*i.e.*, 2 inches at 10 days).

3. Of the injurious salts, found in the soils at Sakrand, *viz.*, Sodium Chloride and Sodium Sulphate, Sodium Chloride can be more easily driven down by flooding than Sodium Sulphate, the latter being retained more firmly by the soil complex.

4. As far as injurious salts are concerned a smaller dose of water given more frequently (*viz.*, 2" every 10 days) was found more effective in checking the rise of salts in soils than larger dose given at longer interval (*e.g.*, 3" every 15 days).

Water requirement of crops

Three crops were tried, viz., Cotton, *Jowar* and *Bajri* on duplicate plots. These were sown on sweet land containing about 0.1 per cent. soluble salts and also on *kalar* land containing from 1.0 to 2.0 per cent. of soluble salts.

The total quantity of water given and the yields obtained were as follows :—

(a) Sweet land

	Calculated yield in lbs. per acre with water at the rate of		
	36" (80 duty)	29" (100 duty)	24" (120 duty)
Cotton (Punjab American, 4F)	1,197 (seed cotton)	807	687
<i>Jowar</i>	1,968 (grain)	1,009	249*
<i>Bajri</i>	1,851 (grain)	1,332	1,161

* This was badly attacked by *Aphis* in the early stage of growth.

(b) Kalar land

	Calculated yield per acre in lbs. with water at the rate of			
	36" (80 duty)	40" (72 duty)	44" (66 duty)	48" (60 duty)
Cotton (27 W.N.)	636 (seed cotton)	1,198	1,236	1,847
<i>Jowar</i>	2,424 (grain)	3,152	3,216	3,621
<i>Bajri</i>	1,329 (grain)	2,442	1,842	1,072

It will be seen from the above table that the yields increase with the increase of water, so far tried, except in the case of *Bajri* in *kalar* land where 40" of water gave more yield than 44" and 48".

In Rabi, two varieties of wheat, viz., *Phandani* (C. Ph. 47) and Pusa 12 were tried but the results are not comparable owing to damage done by frost, due to the intense cold wave which swept across the country at the end of January and the beginning of February.

The usual preventive measures, *viz.*, irrigating the crop, making smoke at night in the field, etc., proved fairly successful on the first day of the frost but were found useless after the frost continued the second and third day. The highest intensity of the frost was as much as 20° F and the total duration of the frost was 7 to 10 hours during night and day for three consecutive days, *viz.*, 30th and 31st of January and 1st of February.

Observations on the Sub-Soil Water Level in Bore Holes

Six bore holes have been taken across the Farm area to take observations of the sub-soil water table. Observations during the year under report show that the general water table is about 30 feet below the ground level. The fluctuation of water table between dry and inundation season is from 3 to 6 feet. The lowest water level is attained in May or June and the highest water level is attained in about October.

Analyses of water from two bore holes gave 26 and 37 parts of soluble salts per million parts of water in October when the water level was at its maximum; the quantity of salts rose to 57 and 86 respectively in June when the water level fell down to its lowest limit.

The whole area of the Farm under cultivation is about 200 acres and it is approximately receiving on an average about two-thirds cusec of water throughout the year. It will be seen how far the sub-soil water level is being affected by the quantity of water running over the area. The ultimate object of these observations is to find out if the water table will rise to such an extent as to cause water-logging after the perennial water supply from the Barrage becomes available. In this connection it is worth noting that for about 6 years since the opening of the Jamrao Canal (in 1899) the water table at Mirpurkhas, which is situated within the area commanded by the Jamrao, rose from one to two feet every year till it came to about 27 feet below ground level and then remained almost stationary when the Jamrao was still flowing. It is worth investigating by sub-soil survey what conditions prevailed at Mirpurkhas and whether they are attainable in the major portion of the Barrage area.

Lateral Movement of Water and Salts from a Water Course

It is a common observation in Sind that a strip of land stretching along a canal on either side of it almost invariably gets moist at first and then impregnated with *kalar*. In order to study the lateral movement of moisture and soluble salts from a water course experiments on a small scale were started during the year under report. The observations, taken so far, show that this movement of moisture depends upon the nature of the soil and its compactness. Observations taken at a place where the compactness, as shown by the use of the stratometer* was less (penetration as measured by the stratometer was about 4" per unit energy) the lateral movement of moisture was about 4 feet in 30 days

* This instrument is devised and described by Mr. Mahomed Zaghoul, Cairo, in Nature dated 7th April 1928, p. 537.

or roughly $1\frac{1}{2}$ inches per day whereas at a place where the compactness was comparatively more (penetration measured by the stratometer was 2" per unit energy) the rate of lateral movement of moisture under similar conditions was about one-third of the above, i.e., about half an inch per day.

Determinations of moistures and total soluble salts show that as the moisture travels laterally and the moisture contents increase the quantity of total soluble salts also increase, as will be seen from the following figures :—

	Spot A (4 feet away from the water course).	Spot B (6 feet away from the water course).	Spot C (8 feet away from the water course).	Spot D (10 feet away from the water course).	Remarks.
	Per cent.	Per cent.	Per cent.	Per cent.	
Moisture ..	19.21	14.41	13.53	10.13	The original moisture and salt contents were about 3 and 0.2 percent. respectively.
Total soluble salts % on dry basis.) ..	0.85	0.30	0.09	0.08	

A small trench dug parallel to the water course gave indication that the lateral movement of water on the surface soil can be apparently stopped. How deep the trench must be dug will depend upon the capillary power of the soil as the moisture from below may come on the surface by capillarity.

Soil Survey of the Farm Area

An intensive survey of the Farm area for the determination of the presence of soluble salts was undertaken during the year under report. Samples of soil were taken from the middle of every 10-guntha plot up to a depth of 2 feet. The surface samples were taken from 0—6" and 6"—12" and the lower one was taken for one foot. At one spot in every two acres, similar soil samples were taken up to a depth of 5 feet; and at one spot in every 20 acres the soil samples were taken up to a depth of 8 feet wherever possible. About 2,000 of these samples have been analysed for their total soluble salts and some of them, about 80, for detailed salts. The results available so far show that a large portion of the Farm area contains soluble salts ranging from 1 to 2 per cent. and comparatively a small area contains less than 0.5 per cent. of soluble salts. Some spots contain as much as 7 to 8 per cent. and more of salts but such spots are very few. The detailed analyses show that in general a larger quantity of salts is found in the first foot of the soil and the quantity gradually decreases in the lower layers. In certain cases, however, it is found that a lower layer contains much more quantity of soluble salts than a layer above or below it.

The constituents of the injurious soluble salts are mainly sodium chloride and sodium sulphate mixed with magnesium sulphate at few spots.

Calcium sulphate is often found mixed with the soluble salts but the presence of the calcium sulphate is rather to be desired than otherwise as besides being harmless it improves the physical condition of the soil by making it more porous.

The work is in progress and final conclusions can be drawn when it is completed.

Miscellaneous

Over 100 samples of soils were received from Executive Engineers for analyses as to their suitability for brick making, as bricks used in the past have developed such bad *kakar* that the walls and arches of many old buildings, bridges and culverts are in a much damaged condition.

A number of samples of water for boiler purposes were also received for analyses from Executive Engineers.

There is also much demand from *Zamindars* for getting their soils analysed at this Laboratory but this cannot be encouraged for want of staff and accommodation.

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**List of Agricultural Bulletins published by the Department
of Agriculture and kept for Sale at the Government
Book Depot, Bombay**

No.	Year.	Subject.	Price.		
			Rs.	a.	p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa.	0	8	0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D. ..	0	4	0
..	1909	Do. do. (Kanarese) ..	0	4	0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona ..	0	4	0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist ..	0	14	0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta ..	0	4	0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona ..	0	5	0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon.	0	12	0
41	1911	Groundnuts in the Bombay Deccan ..	0	4	0
43	1911	An Examination of the Seed-Supply of the Broach District, Part II ..	0	5	0
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency ..	0	8	0
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No.	Year.	Subject	Price		
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CHAPTER I

FEATURES OF THE YEAR

Monsoon.—The special feature of the 1929-30 monsoon was the long break in the middle, following good rainfall at the beginning. In Gujarat after mid-July there was very little rain till the end of September. Thus the rice crop was more or less poor in middle Gujarat, while the good rains early in October ensured the cotton crop. In Khandesh this long break had a very bad effect upon the kharif crops, with groundnut suffering most. In this tract the late September rains were poor, and hence the rabi crop was more or less a failure. In the Deccan the rabi crop was poor owing to the unsatisfactory distribution of the rains. In the Karnatak the long break adversely reacted on the kharif crop but the rabi crop was normal. In the Konkan the kharif season was good in the north, but not satisfactory in Ratnagiri and Kanara districts in the south. Sind had an unparalleled rainfall; thus East Sind received as much as 50 inches, while the rest of the province received amounts varying from 10 to 30 inches. This rainfall was for the most part received between the 13th July and 27th August.

Floods.—In Sind the River caused unprecedented floods. In the early part of the inundation season the water level was much below normal; in early September, however, the River rose to the abnormal height of 17'-3" at Bukkur. The bursting of the Shyok Dam coming immediately after heavy rain in the north of India and Sind itself, caused the Indus to overflow both banks in many places and to bring about widespread and unprecedented flooding, especially in Sukkur, Hyderabad and Nawabshah Districts, and this necessitated the temporary evacuation of the Agricultural Research Station at Sakrand which became surrounded by water on all sides but fortunately escaped being inundated. It was also fortunate that the rice crop in Larkana and Karachi Districts was mostly saved. These floods caused considerable loss of livestock and property but they served one useful purpose in stocking the soil with moisture; and the rabi crop was both extensive and successful.